

Is a transactions tax an effective means to stabilize the foreign exchange market?*

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1. Introduction

Proponents of a tax on foreign exchange (hereafter forex) transactions aim at two distinct objectives. One is fiscal redistribution at the worldwide level. It is argued that global welfare would benefit from the introduction of an indirect tax, the proceeds of which are channeled to the funding of socially valuable projects for poverty reduction. The argument is often strengthened by the claim that the activities of forex traders (or 'speculators') play a socially harmful function, for they are often made at the expense of developing nation's welfare, such as when a developing nation's currency is 'oversold'. This contention justifies why a tax should be collected from forex traders, as opposed to other potential taxpayers.

The other objective is a reduction of trading volume through a containment of 'short round trips', i.e., forex trades that are reversed within a short time horizon. This, it is argued, would make exchange rates more 'sticky', or less flexible, and help stabilize the world economy. Tobin's original contention was that the forex market's speed is excessive, relative to the much slower pace of adjustment of the markets for goods and labour: throwing "some sand in the wheels of our

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excessively efficient international money markets"¹ would produce greater financial segmentation and thus enhance domestic policy autonomy. Tobin considered currency markets highly efficient in an operational sense, and yet remained sceptical that 'unanchored markets' can guide economies to their optimal path. A transactions tax would be a means to tame the 'troublesome perfection' of financial markets. Indeed, the 1990s revival of Tobin's proposal has largely been built on the notion that the forex acts as a destabilizing factor that sends wrong signals, especially to 'genuine' long-term investors who may procrastinate their investments when volatility is excessive.

The merit of the fiscal redistribution objective should be evaluated on criteria of public finance, including such issues as the feasibility of the tax, its ability to generate revenue, and ultimately the net social benefit from tax revenue collection and redistribution. These questions are not directly addressed here. The assessment of the net social benefit, however, depends on the impact of the tax on market volume and activity, and this is, of course, central to the trading volume reduction objective, as well. As it turns out, an understanding of the effects of the tax on the market, and whether a transactions tax can be a means to contain short round trips and stabilize the foreign exchange market, is essential to an assessment of the power of the tax in achieving *both* goals.

In this respect, supporters of the tax have argued that it is a win-win proposition: should the tax leave market volume unchanged, the case for redistribution would be strengthened by the consideration that the tax has no distortion effects on market prices; should the tax succeed in reducing market volumes, the distortions caused by the tax would be offset by the benefits from limiting destabilizing, 'short-term' market activity. This win-win proposition is only valid, however, if it can be proved that a reduction of market activity, as caused by the tax, has net positive welfare effects. Thus, the desirability of a transactions tax depends on two central tenets: *a*) the tax would shut off trades with short holding periods; and *b*) short round trips are a source of instability.

A close examination of these tenets and of the broader impact of a transactions tax on the forex market is the subject of this paper. Section 2 is an attempt to resolve some lingering questions about the

¹ Tobin (1978, p. 154).

arithmetic of a transactions tax. Its main conclusion is that a tax would raise the required return from trade (by a factor that depends on the size of the tax) for *any* time horizon, and that the tax would deter those trades driven by *small* expected capital gains, not necessarily those driven by a *short* horizon. If this is true, the next question about the value of the tax is whether there are positive effects from shutting off those trades driven by small, expected capital gains. Section 3 explores diverse answers to this question, within competing paradigms in monetary and financial economics. It shows that a clear rationale for a transactions tax that raises the required rate of return of trade can hardly be found in any of the existing paradigms. Indeed, when one views the currency market as a means to enhance international liquidity of domestic currencies, and considering the findings of the high-frequency finance empirical literature, a transactions tax is likely to be more harmful than beneficial to exchange rate volatility and market liquidity. The proposition that a transactions tax can make short-term speculation unprofitable, and thus enhance the autonomy of monetary policies and limit 'speculative attacks', rests on dubious analytical ground, and a decision to implement such tax globally as a device to reduce financial instability would be a high-risk, unjustified experiment.

2. The deterrent effect of a transactions tax on currency trading

Does a transactions tax discriminate against short-term trades? Or, rather, does it hurt any trade, independently of time horizon? Proponents and critics of the tax have answered these questions differently. The common belief among supporters of the tax (and even among some of the critics who question the feasibility of the tax) is that it is a deterrent for short-term capital flows, as its burden is *inversely proportional* to the length of the round trip: thus, the shorter the holding period, the heavier the burden of the tax. For example, Dornbusch and Frankel (1987) argue that "a moderate, worldwide transactions tax on foreign exchange" would have negligible impacts on long-term capital movements but "the profitability of short-term round trips

would be dramatically curtailed".² This proposition is corroborated by a formula, further elaborated by Frankel (1996), indicating that the required (before-tax) rate of return abroad is inversely related to the length of the investment. In the 1995 *Economic Journal* paper "Policy Forum: Sand in the Wheels of International Finance", Eichengreen, Tobin and Wyplosz had supported the adoption of a transactions tax in the forex market as a deterrent for speculators with "shorter horizons and holding periods".³ The authors point to the fact that investors who make short and frequent trades will pay more taxes over a one-year period, as compared to investors who trade less frequently.

One dissenting opinion is held by Davidson, who argues that "the Tobin tax, like all transaction costs, is independent of the round trip time interval, and therefore its deterrent capability is not a function of the time period".⁴ This proposition is demonstrated by a formula indicating that the magnitude of the minimum expected changes in the exchange rate that must occur to induce bullishness or bearishness depends on the size of the tax, and not on the holding period.

The most noticeable difference between Frankel's and Davidson's formulations is that the former studies the effect of the tax on the required (before tax) annualized rate of return (including capital gains or losses) of an investment in foreign assets, while the latter studies the effect of the tax on the required capital gain of a speculative trade in foreign currencies. There is no reason these two methods should lead to conflicting conclusions, and the fact that they do suggest that further inquiry is in order. Unfortunately, no systematic comparative analysis of these two different formulations of the problem has been offered so far. The aim of the comparative analysis in this section is to evaluate these two propositions about the effect of a transactions tax on trade, by inspecting the arithmetic of the formulas as well as the assumptions behind them.

2.1. *Frankel's approach*

Frankel uses two formulas: one applies to a round-trip investment where an investor buys a foreign asset and later resells it, while the

² Dornbusch and Frankel (1987, p. 46-7).

³ Eichengreen, Tobin and Wyplosz (1995, p. 165).

⁴ Davidson (1997, p. 675).

other applies to a roundtrip where only the interest earnings are repatriated, and the principal is left abroad. In either case, Frankel concludes, the Tobin tax "penalizes short-term investments the shorter is the horizon".⁵ Here, I will only consider the former formula, which best captures the 'speculative' type of trade that the Tobin tax intends to deter.

Frankel (1996), following Dornbusch and Frankel (1987), builds the argument on a simple equilibrium condition: with capital mobility, the activity of traders who maximize their yields will equalize the (after-tax) returns on domestic and foreign assets (of equal risk). With no tax, profit opportunities are eliminated when

$$1 + i^* = 1 + i, \quad (1)$$

where i^* is the required return on an investment in foreign assets, and i is the return on a domestic asset (over the same holding period).

With a transactions tax, investors seeking to invest abroad will require a greater return that compensates for the tax. Hence, a tax drives a wedge between the before-tax yield and the after-tax yield of an investment abroad. In Frankel's formulation, the equilibrium condition is written as:

$$(1 + i^*)(1 - t) - t = 1 + i, \quad (2)$$

where t is the transactions tax.

Solving for the required rate of return,

$$i^* = (i + 2t) / (1 - t). \quad (3)$$

It is not imperative to 'annualize' this formula (which is valid for *any conventional accounting period*, provided that the same period applies to i^* and i), but if one wishes to use annualized rates (and Frankel does), then the formula should be rewritten as:

$$(1 + i^*N)(1 - t) - t = 1 + iN, \quad (4)$$

where N is the ratio between the conventional accounting period and the holding period of the investment (e.g., if the holding period is one month and the conventional accounting period is twelve months, then N equals 12). The annualized required rate of return is:

$$i^* N = (iN + 2t) / (1 - t). \quad (5)$$

⁵ Frankel (1996, p. 58).

We may want to refer to a couple of numerical examples: assuming a tax (t) of 1% and a domestic annual return (i) of 12%, the required annual return on an investment abroad of one year (using either formula 3, or formula 5 with $N=1$) must equal 14.14% (i.e., a wedge of approximately 2%). Assuming the same tax, but a domestic annual return of 1%, the required annual return on an investment abroad of one year must equal 3.03% (i.e., again a wedge of approximately 2%). When the investment abroad has a horizon shorter than one year, e.g., one month, and if the domestic monthly return (i) is 1%, formula 3 tells us that the required monthly return on an investment abroad (i^*) must equal a monthly 3.03% (i.e., still a wedge of approximately 2%), or, as formula 5 indicates, an annualized 36.36% return.

To validate his conclusion that the tax "penalizes short-term investments more the shorter is the horizon", Frankel would compare the *annualized* required returns for these examples: when the domestic investment yields 12% per annum, it takes a 36.36% annualized return to make a one-month round trip in a foreign asset attractive, compared to only 14.14% return when the investment horizon is one year. This comparison, however, is misleading for two reasons.

The first reason is that the investment return in Frankel's formulation lacks a distinction between interest rates and capital gains (or losses), and this is especially problematic when we consider the forex market. Frankel's 'return' is the sum of the interest obtained from holding the foreign asset and any capital gains or losses obtained when reverting to the domestic currency. To make this explicit, condition 1 should be written as:

$$(1 + i_y) * (p^1 / p^0) = (1 + i) \quad (6)$$

where i_y is the interest paid on the foreign asset in the holding period; p^1 is the expected price of the foreign asset at the end of the holding period, and p^0 is the price at the beginning of the holding period.

In the numerical example above, a 36.36% annualized return on a one-month investment could result from, say, a 3.03% interest in one month (i_y) and no capital gain or loss ($p^1 = p^0$), or a combination of a 1% interest in one month and a 2.03% capital gain (and of course an infinite variety of other combinations). In this latter example, an expectation of a 2.03% appreciation over one month would be enough to offset the deterrent effect of the tax. This is the problem that Kenen (1995) had noted when he argued that although the annualized wedge

driven by the tax on a short horizon trade can seem huge, the expectation of a relatively small change in the exchange rate over a short horizon could easily offset the tax. In other words, even a small capital gain may imply a quite large return per annum: if it is true that the shorter the horizon the larger the required annualized return, it is also true that the shorter the horizon, the greater is the annualized return implied by a given capital gain. In practice, a Tobin tax of 1% could not have prevented the sizeable movements of the Mexican peso in 1994-95 or the Thai baht in 1997, and not even the less dramatic but quite meaningful movements between the dollar and the euro so far.

The second reason that comparing annualized returns is misleading is that a period of one year is a conventional accounting reference, while traders must look at the return differential for their own time horizon. When interpreted correctly, formula 3 tells us that the wedge driven by a 1% tax is approximately 2%, irrespectively of the holding period: the tax cuts off investors interest for any foreign investment that yields less than 3.03% when domestic return is 1%, or that yields less than 14.14% when domestic return is 12%. It is mathematically obvious that the annualized wedge rises with a shorter time horizon, but this results from the convention of annualizing the returns, and it should not obscure the fact that, given domestic return, the additional required return imposed by the tax depends on the size of the tax, not on the time horizon.⁶

In conclusion, the problem with Frankel's formulation lies both in the lack of distinction between interest payments and capital gains, and in the unwarranted use of annualized formulas. This approach gives the impression that the tax selectively harms short-term trades, while in fact it raises the required return for *all* holding periods. Thus, Frankel's approach does not show that the wedge, driven by the tax, increases with shorter maturities.

2.2. Davidson's approach

Different from Frankel's approach (expressed in terms of rates of return), Davidson's argument is carried on in terms of capital gains.

⁶ Only a trader who expects a return that repeats itself for n periods, and is indifferent between executing n short round trips and one single long round trip, would find the long round trip preferable when a transactions tax is introduced. This consideration, however, is hardly relevant, as interest rate differentials are no ground for currency speculation (see below).

This seems to better fit the question of whether a Tobin tax could reduce the opportunities for speculative investment, by penalizing those trades that are triggered by short-term capital gains.

In Davidson's formulation, when a transactions tax (t) is paid on a round trip, the required ratio between the expected (p^1) and the current (p^0) price of the foreign asset must be calculated on the basis of the following equilibrium condition:

$$(q - c) + (p^1 - p^0) - t(p^1 + p^0) - T^s = 0, \quad (7)$$

where q is the yield of the asset, c is its carrying cost, t is the transactions tax (paid when buying the foreign currency and again when reselling it), and T^s is the transaction cost. Following the terminology used by Keynes in discussing the yields of an asset in chapter 17 of *The General Theory*, all variables are measured as absolute values.

In order to simplify formula 7, Davidson proceeds with the assumption that

$$q - c - T^s = 0. \quad (8)$$

Assuming 8, equation 7 then becomes:

$$(p^1 - p^0) - t(p^1 + p^0) = 0. \quad (9)$$

Assuming 8, however, means to restrict the analysis to one particular time period: the yield (q) and the carrying cost (c), both measured as flows, rise with the length of the period, while the cost of executing the transaction (T^s) is independent of the holding period. Thus, condition 8 only holds when the holding period is such that the (fixed) transaction cost (T^s) is exactly matched by the net yield ($q - c$). The particular holding period for which 8 holds $q - c = T^s$ is shorter, the larger is the net yield of the asset.

Since there is only one holding period for which 8 holds, this amounts to assuming a fixed holding period. Solving for the required capital gain, one obtains:

$$(p^1/p^0) - 1 = 2t/(1 - t). \quad (10)$$

Condition 10 indicates that the required capital gain is a positive function of the size of the tax: a transactions tax of 1% cuts off investors' interest for any foreign investment that yields less than 2.02%. Davidson then argues that "the Tobin tax is more likely to be a constraint on arbitrage flows rather than on speculative flows" and that

“a ‘grain of sand’ small Tobin tax might slow down the speculative fever when ‘grain of sand’ small exchange rate changes are expected”.⁷ The point made by Kenen that a transactions tax may be inadequate to “offset the gain expected from betting on a near-term devaluation”⁸ is made evident by Davidson’s formula, where it is clear that most ‘large’ swings in the forex market could not be prevented by a tax in the magnitude of 1%.

The advantage of Davidson’s over Frankel’s formula is that by focusing on capital gains, rather than on annualized rates of return, it more clearly addresses the question of how the tax reduces the incentive for traders to bet on exchange rate changes. Davidson’s result, however, is only valid for the assumed holding period (i.e., the period for which δ holds), and it cannot be generalized for all time horizons. If, for example, the net yield and the transaction cost are perfectly offset (i.e., $q - c = T^*$) when the holding period is z days long, then a transactions tax of 1% requires a capital gain of at least 2.02% in a z -day period. If the holding period is shorter than z days (and thus the net yield is short of the transaction cost), then the $(q - c - T^*)$ term is negative, and the required capital gain must be higher than 2.02%. Although this depends on the fixed transaction cost, and not on the transactions tax, it may still leave the impression that the shorter the holding period, the larger the required capital gain. Thus, it is not surprising that Davidson’s proposition that the deterrent effect of the tax does not depend on the holding period has received less attention than Davidson’s caveat that the deterrent effect of the tax is insufficient to prevent large swings.

2.3. *Using the interest parity condition*

If Frankel’s formula does not adequately address the distinction between interest payments and capital gains, and Davidson’s formula does not adequately address the question of the length of the holding period, a better formulation of the effect of a Tobin tax is in order. This ought to clearly separate interest from capital gains and also adapt to any holding period. A reformulation of the problem based on the interest parity condition is offered here.

⁷ Davidson (1997, p. 678).

⁸ Kenen (1995, p. 189).

The interest parity condition is used here to state the condition that makes a trader indifferent whether holding the domestic (x) or the foreign (y) currency. This is not when the expected and the current price of one currency in terms of the other are equal (i.e., $p^1 = p^0$), but rather when:

$$p^1/p^0 = (1 + i_x) / (1 + i_y), \quad (11)$$

where i_x is the interest on holding an account denominated in domestic currency units, and i_y is the interest on holding an account denominated in foreign currency units. This means that if a trader considers selling an account denominated in US dollars to hold one denominated in euros, to reverse the trade (i.e., going back to US dollars) in a month, there is no expected gain if the expected appreciation of the euro is offset by a comparatively higher interest paid on dollar-denominated accounts.

Formula 11 is equivalent to Davidson's formula 7, with the difference that 11 ignores transaction costs, and that interest payments, considered for both currencies, are measured as rates of interest. The advantage of formula 11 is that it is valid for any time horizon, providing the interest rates refer to the same time period (i.e., they ought not to be annualized).

Formula 11 can also be obtained from Frankel's formula 1, when return is shown to result from interest payments and capital gains, i.e., after replacing 1 with 6.

How would a transactions tax modify equilibrium condition 11? If we assume a tax is paid on each forex transaction as a percentage of the ask price, or of the bid price, at which the trade is executed, the speculator will find the price of the foreign currency, as well as the price of the domestic currency when the trade is reversed, augmented by 1%.⁹

Thus, no speculative opportunity exists if

$$(p^1/p^0) = (1 + t)^2 (1 + i_x) / (1 + i_y), \quad (12)$$

⁹ The ask price paid to acquire the foreign currency is $p^0 (1 + t)$, while the bid price obtained when reselling the foreign currency is $p^1/(1 + t)$. This is different from Frankel's formula 2, where the term $(-t)$ assumes that, when the foreign asset is repatriated, the trader will pay a tax proportional to the initial principal, when in fact the tax must be proportional to the amount that is being repatriated; and where the term $(1-t)$ inaccurately calculates the burden of the tax as a percentage of the after-tax (rather than the before-tax) value of the forex transaction.

where p^0 is the purchase price of the foreign currency, p^1 is the expected selling price of the foreign currency at a future point in time, i_x is the interest paid for holding the domestic currency, and i_y is the interest paid for holding the foreign currency.

Formula 12 shows most clearly that given i_x and i_y , and irrespective of time horizon, the introduction of a tax will force speculative traders to require a capital gain that is $(1 + t)^2$ times higher than in the absence of the tax. The term $(1 + t)^2$ measures the size of the wedge driven by the tax for *any* holding period.

A simplified formulation, when one assumes that i_x and i_y are equal, is that the return (r) of a round trip of any length is:

$$r = (p^1/p^0) [1/(1 + t)^2] - 1, \quad (13)$$

where r is positive if

$$p^1 > p^0 (1 + t)^2. \quad (14)$$

While the tax makes the condition for profitable speculation more stringent for all traders, each trader's reaction will depend on the size of the expected capital gain. The same trader who, on the basis of a relatively small capital gain expectation (in either a short or a long horizon), may be actively engaged in a speculative trade when there is no tax, may see the capital gain disappear with the tax, and thus decide not to trade. Only those traders for whom the expected capital gain remains positive even with the tax will continue to be operative.

Viewed in this light, and if this analysis has value, it is incorrect to argue that a transactions tax discourages short-term speculative round trips and its deterrent effect is larger for short round trips. Rather, it is correct to argue that the tax hurts any speculator acting on 'small' expected returns (i.e., smaller than the square of $1 + t$).

3. Would shutting off trades with small, expected capital gains contain instability?

A highly commendable aspect of the proposals for a forex transactions tax is the concern for the effects of currency instability on global welfare. The disillusionment with floating rates has gradually made economists more open to the search for solutions, even 'second best'

solutions, to the widely recognized problems with the current international monetary system. Corrections to the system have been proposed and implemented, and proposals for a more fundamental redesigning of the international monetary arrangements have been and are being discussed. The conditions that led to recent episodes of international instability have also revived awareness about short-term capital flows as a constant threat to international liquidity and economic growth; but that a transactions tax might be the right means to at least start a redesign of the global economy remains controversial.

The analysis above has shown that the tax does not penalize round trips with a shorter horizon. Rather, it penalizes all trades for which the expected return is too small to compensate for the tax. Although it may often be the case that trades with short horizons are also trades driven by relatively small expected returns, the distinction is essential and no confusion should be made: a tax that bears more heavily on short round trips (if such tax can be devised) would lengthen the average holding period of traders. Instead, the Tobin tax, bearing proportionately on all trades, hurts any trader who is seeking profits from small exchange rate movements. Thus, its effectiveness in reducing forex volatility remains ambiguous, considering that the tax leaves operative those traders who expect *large* variations in exchange rates. Could not this mean low market liquidity in 'quiet' times, and extreme movements in 'nervous' times? If this were the case, the outcome would be opposite to the aim of market stabilization, and the merit of fiscal redistribution should be reconsidered, as well.

Having first determined how a transactions tax affects traders' behaviour, this section considers its predictable consequences on price volatility and market liquidity within diverse analytical backgrounds.

3.1. *Efficient markets*

It will suffice here to note briefly that within the efficient market paradigm a transactions tax makes little sense. Assuming efficient currency markets is equivalent to assuming well-defined available information, which rational traders interpret intelligently, in a world where time series averages are predictable. In such markets, where currency rate movements reflect changing information (news), a tax could prevent the necessary price adjustment when the news causes 'small' changes in expectations. This would lower market efficiency.

The effect on volatility would be twofold: on the one hand, preventing price adjustments reduces volatility (although it weakens the signalling function of prices). On the other hand, when the disparity between information and prices is large enough to offset the tax, prices would adjust more violently than in the absence of the tax. This suggests a possible 'fatter tail effect' in the probability distribution of price movements.

3.2. Behavioural finance

If a rationale for a tax can hardly be found within the efficient markets hypothesis, its major competing paradigm offers more room for improving market efficiency and lowering market volatility. In the view of behavioural finance, financial market traders are subject to persistent, psychological biases, and currency markets may not possess information efficiency. Because traders do not always behave rationally and may be subject to psychological biases, market prices may swing for reasons unrelated to news, deviate from the information-efficient vector, and cause anomalies and volatility not justified by changes in information.

The behavioural finance paradigm, however, provides no strong ground for a transactions tax, either. Robert Shiller, one of the leading figures in behavioural finance, argues that transactions taxes on financial assets "have not usually resulted from any clearly articulated theory of restraining speculation" and that he has "not found the case strong enough to recommend any such action".¹⁰ Rather, Shiller's recipe to improve the quality of market prices and contain instability is to take action to expand the number and the variety of markets, broaden the participation of increasingly educated traders, and devise ways to attract investors' interest towards fundamentals.

Indeed, assuming irrational biases in traders' behaviour provides no sufficient ground for a transactions tax, unless one can prove that the tax hits the 'bad' trade relatively more than the 'good' trade. Since the tax cannot be *ad personam* but *ad valorem*, one ought to devise a tax that hurts the 'noise' traders (who either have no information or interpret information wrongly due to a psychological bias) comparatively more than educated traders: if only the 'noise' traders are taxed,

¹⁰ Shiller (2000, pp. 227-28).

the market will be driven by educated traders. Thus, a case can be made if we assume that *a*) it is possible to differentiate between educated and psychology-driven traders; and *b*) it is possible to devise a tax that discourages only the latter group from trading.

Supporters of the Tobin tax have attempted to build a bridge between behavioral finance and the Tobin tax. Palley (1999), for example, presents a model where he assumes two well-defined groups of traders: 'noise' and 'fundamental' investors. The former group is the primary target of the tax: a Tobin tax would unambiguously discourage noise traders from selling the asset whose return they underestimate, and would thus contribute to market efficiency and stability. It remains to be determined whether such clear-cut distinction between traders is to be found in actual markets, and how a tax could effectively discriminate.

Other, less rigorous arguments suggest that when markets are dominated by herd behaviour, a tax that prevents small deviations from fundamentals could help prevent the beginning of herd movements and thus lower the chances of large deviations from 'fundamentals'. On the matter, authors often resort to the authority of Keynes and his famous "beauty contest" hypothesis about the behaviour of stock market traders. Keynes, however, never suggested that a market dominated by the beauty contest could be turned into a market governed by fundamentals, as he thought an objective assessment of fundamentals is unattainable. In discussing a transactions tax as a device to limit stock market speculation and favour enterprise, Keynes (1936, pp. 160-61) made it clear that such provision would lower the liquidity of the market. As a better alternative, he stressed, in the same chapter, the need for finding ways to prevent individuals from reducing aggregate demand and, in his late years, he stressed a global solution to stabilizing international payments through the provision of a central-bank money issued by an International Clearing Union. His basic idea was that removing the primary cause of international payments instability should be preferred to creating obstacles to markets and liquidity.

3.3. *Imperfect markets*

As recalled in Section 1, Tobin's proposal was not based on the premise that currency markets lack information efficiency. Based on 'second-best' theory, it rather stressed their operational efficiency and

their speed, compared to the imperfect virtues of labour and product markets. It started with the belief that, in principle, free currency markets are fine, except that other markets (specifically, the product market and the labour market) are imperfect and slow to adjust. If this is the case, a highly efficient currency market may not be optimal. If in a factory a machine working in sync with another machine becomes slow, it is optimal to slow down the other machine as well. In the same way, a mechanism that slows down the currency market may be optimal if the rest of the economy is slow to adjust as a result of market rigidities and information asymmetries.

For Tobin, a reduction of volatility is not the primary goal, and is not even a likely outcome of the tax. His tax was aimed at enhancing policy autonomy by discouraging short round tripping. If, as argued above, the tax does not hurt short round tripping, the effectiveness of the Tobin tax is questioned. The market segmentation that would result from a transactions tax could only prevent small variations of currency rates, and it is doubtful that monetary policy autonomy could be significantly enhanced. In their 1995 call for a tax, Eichengreen, Tobin and Wyplosz argued that market segmentation was required as a necessary, temporary measure to protect the Exchange Rate Mechanism in Europe and save the process of creating a single currency by 1999. The poor prediction of the fate of the euro convergence in the absence of some transactions tax did not consider the power of the market 'anchor' created by the Germans' clear political will to include the 'weak currencies' of Europe in the European common currency from start. Indeed, it could have been dangerous to adopt a tax to give European governments more leeway in their monetary policies with no sufficient protection from large swings.

3.4. *Markets as liquidity-providers*

Another line of criticism of the virtues of a floating rate system and of the allocation properties of financial markets driven by speculative trades is that developed by the Post Keynesian tradition within a theory of financial markets as liquidity providers under radical uncertainty. This view differs from the paradigms considered above in so far as it stresses the role of financial markets as liquidity-providers, rather than allocative mechanisms. Different from other financial markets,

where titles to real assets are made more liquid by continuous trading, the forex market offers a place to transform 'domestic' liquidity (of any money) into 'international' liquidity. Currency markets make currencies liquid internationally. Not all moneys traded, as we all know, are of the same quality, and the US dollar is the most liquid one, serving the purpose of the international money that saves us from 'bartering', say, Brazilian reals against Turkish lire.

From this angle, liquidity matters in two respects: first, if it is true that international instability originates from a problem of international liquidity rather than inefficient pricing, then the way to mend the international monetary system is to devise new institutional arrangements that effectively address the international liquidity problem, not to attempt to correct the 'price discovery process'. Second, market liquidity is ensured by a multitude of heterogeneous traders, and specifically by a subgroup of daily traders who act as market makers. A transactions tax would likely hurt the intra-day traders, who act on small, expected price variations. Action of both speculators and market-makers, who provide liquidity by playing as counterpart to the random orders coming from non-daily traders, would thus be discouraged, with a likely negative impact on market liquidity and the operational efficiency of the market. A reduction in market liquidity could mean a further increase of the power of the US dollar, for the introduction of barriers in trading is likely to emphasize the liquidity hierarchy among currencies.¹¹

3.5. *The findings from high-frequency finance studies*

Empirical studies of high-frequency data in currency markets have given us a better picture of market microstructure, and offer a significant contribution to our understanding of the heterogeneity-driven asymmetry in currency markets. One empirical result in this literature¹² is evidence corroborating the heterogeneous market hypothesis that investors are not driven by rational expectations, but rather by

¹¹ This same point is made by Grahl and Lysandrou (2003), who contrast the common belief that foreign exchange trading is largely driven by price speculation with the reality of a rapidly declining volume share of speculative spot trades and of a growing share of non-speculative, swap transactions driven by liquidity considerations in a globalized money market.

¹² For a primer in this field of research, see Dacorogna *et al.* (2001).

the heterogeneous expectations of market participants who differ in terms of dealing frequencies and time horizons. There are traders who carry positions overnight with short-term or long-term horizons, and there are intra-day traders who close their positions within the day, often within minutes. Of these, some are dealers who take advantage of arbitrage opportunities, others are market makers who profit predominantly from the bid-ask spread, and still others open positions for a few hours or minutes to make capital gains. Traders also differ with respect to their access to news, including 'local' news, such as phone calls from clients, chat with colleagues, reading of in-house fundamental or technical forecasting charts, reaction function to news, risk aversion, risk perception, institutional constraints, degree of access to market and transactions costs. All these diverse components of the market interact in a complex system.

Using high-frequency time series methods, Dacorogna *et al.* (2001) argue that the empirical properties of volatility suggest an asymmetry between short-term (intra-day) volatility, affecting short-term trader behaviour only, and long-term volatility affecting all traders. This implies that short term traders do not react in the same way as long term traders do to the same information. It also implies that high-frequency shocks are more likely to remain within the boundaries of the daily traders, while low-frequency shocks penetrate the whole market and may generate shockwaves. If this characterization of the forex market is legitimate, then a transactions tax would likely hurt those traders who are least responsible for market volatility. Also, market makers would likely widen their spreads if they perceived a higher probability of extreme returns within short time intervals. At a minimum, it seems hard to identify within the forex microstructure a clear-cut category of traders who deserve to be penalized for the purpose of reaching a public interest.

3.6. *Intra-day interest payments*

There is one final point that is worth exploring. It is an aspect of forex markets that has been neglected in the debate on the transactions tax as a means to contain exchange rate instability. The forex market is based on a conventional scheme of discrete (daily) interest payments. This means that positions that are closed within the day, i.e., 90% of

market trades,¹³ do not generate interest rate payments or charges. As a result, the market is biased towards shorting currencies with the highest interest rates. It also means that when central banks raise interest rates to protect their currency, this has no consequence on intra-day dealers (or perhaps a perverse effect driven by expectations of further depreciation).

In times of extreme exchange rate volatility, high interest rates paid on weak currencies could attract capital flows to these currencies and help stabilize them. As long as most of the trade that sets the spot rate of a currency is intra-day, and as long as no interest is paid to holders of a currency for fractions of a day, this important tool to stabilize weak currencies is completely inoperative.¹⁴

4. Conclusion

Although the aims of transactions tax supporters have merit, there is insufficient evidence to conclude that imposing a global tax on forex trades is an effective means to reach the declared objectives. This paper has shown that the impact of a tax on traders' behaviour should be carefully reconsidered: a transactions tax does not hurt short-term trades, but rather raises the required rate of return for all trades. Under none of the existing paradigms, such a device generates unambiguous net positive welfare effects. Independently of other questions raised against this tax (such as its feasibility) the experiment is not justified. Rather than running the high risk of implementing a dubious global reform, researchers should channel their resources towards the question of how best to tackle the problems of international liquidity and its impact on global and local growth.

¹³ Dacorogna *et al.* (2001, p. 14).

¹⁴ I am indebted to Richard Olsen for this point.

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