ECONOMICS

Lost Inflation?

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DISCUSSION PAPER 18.01
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UWA Business School Discussion Paper

Key words:
Inflation, productivity, automation, income distribution, tax, transfers, general equilibrium analysis

JEL Codes:
D33, E52, J11, O33

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** Thanks are due to Grace Taylor at the Reserve Bank of Australia for assistance with data. The model used in the paper is solved using the Gempack software.
Lost Inflation?

Abstract

Concern about “lost inflation” has been heightened recently by the apparent inability of central banks in the largest democracies, a decade beyond the GFC, to restore their “safe” CPI inflation ranges. This paper examines the deflationary forces against which monetary policy is now aligned, namely migration, the race to the bottom in capital taxation, and biased technical change, and assesses the consequences looking forward. While inflation rates have edged lower over the past two decades the most important change has been declines in long maturity yields, initially driven by strong growth in high-saving Asia and by redistribution in the advanced economies to high-saving households, and bolstered subsequently by return pessimism due to low growth in measured productivity. Ironically, today’s low rates also stem from conventional monetary policy failure, expanded central bank balance sheets and the resulting global “bond bubble”. Future monetary policy effectiveness as deflationary forces continue will depend in the advanced economies on government interventions to address underlying inequality and financial market “normalisation”.

1. Introduction

Not only has the rate of inflation in Europe, Japan and North America been seen as undesirably low (Blitz and MacKenzie 2017, The Economist 2017b) but the duo of low inflation and low interest rates is expected by many to continue, with unfortunate consequences (Financial Times 2017). Concerned about defending the economy during the “next recession”, the US Fed is considering changes to its monetary targeting arrangements that would sustain monetary expansions in search of a higher inflation trend (Summers 2017, Brookings Institution 2018). Yet short interest rate declines of several percentage points have been required to restore economic performance in previous recessions and there is no longer room for such cuts without further unconventional monetary policy (UMP) in the US and its continuation in Europe and Japan. The downsides of further central bank asset expansions, however, include widening income and wealth disparities, low productivity growth, trade tensions and disruptive property booms, particularly outside the UMP-implementing economies.¹

¹ The literature on UMP and its consequences is now large. There is no doubt that UMP helped restore liquidity and capitalization to the banks and other financial institutions (Chodorow-Reich 2015). Its downsides, however, not only include increased wealth disparity and the negative feedback loop that sees low yields motivate portfolio money holding, which demands monetary expansions via UMP that further reduce yields. See the comments from central bankers in Blitz and Mackenzie (2017), and particularly from the US Fed. There is enhanced risk of financial bubble behaviour, the perpetuation of inefficient “zombie” firms and the increased vulnerability of these firms and indebted households to yield reversals. See Burns et al. (2014), BIS (2017), Glugliano (2017) and Watling (2017).
Central banks are perceived to be less equipped to offset deflation with monetary expansions because of the several-decade declining trend in the “natural” rate of interest at the global level and the looming proximity of the “zero lower bound” (ZLB). The ZLB arises because of the perception that no-one would choose to hold negative yielding bonds when zero-yielding cash is available as an alternative.\(^2\) When the short nominal rate falls close to the ZLB the capacity for conventional monetary policy to generate inflation is limited. This begs two questions. Is deflation so much worse than inflation, and what are the deflationary forces that central banks are fighting against that have become so potentially overwhelming?

For Keynes (1950: 10, and 2007: 16), actual deflation is always to be avoided, relative to inflation, because, in the presence of nominal wage rigidity it leads to unemployment, it discourages lending for investment and it encourages the “hoarding” of money, or a rise in the holding of portfolio money at the expense of productive assets.\(^3\) The modern expression of this concern is as in Shiller (2017), who reminds us, accurately, that low inflation expectations are important because they suppress incentives to invest in productive capital expansion. Yet, while the prospect of deflation is always associated with a lack of perceived capacity of central banks to accommodate money demand, there are increasingly prominent deflationary forces in the global economy.

The advanced economies in Europe, North America and Australasia are experiencing rising rates of immigration. These flows suppress real wage growth and benefit higher-income households whose saving rates from disposable income are comparatively high and whose contributions to domestic demand in a globalised economy are comparatively low. At the same time, technology changes in these economies are displacing low-skill workers and favouring the skilled and capital-owners. This not only curtails demand generated by low-saving worker households but the greater returns to capital owners also stimulate financial inflows, which appreciate these countries’ real exchange rates and reduce home consumer prices.

Finally, there is the emergence in these economies since the early 2000s of a tendency to outsource manufacturing and service activities to poorer countries that offer reduced wage costs, environmental controls or corporate tax rates. For the advanced economies this has

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\(^2\) This perspective is not universal, however, with negative rates emerging not uncommonly in recent years and Rognlie (2016) suggesting the possibility of effective monetary policy with negative rates.

\(^3\) For a detailed exposition on this topic see Bagus (2015). The behaviour of portfolio demand for money was formalized by Tobin. See Tobin and Hester (1967).
seen an important rise in trade in intermediate inputs and components, a decline in domestic relative to foreign value added shares and therefore a period during which domestic expenditure has fuelled international, at the expense of domestic, factor incomes (Constantinescu et al. 2015, Duval et al. 2015). In effect, domestic supply has grown faster than domestic factor income, again applying deflationary pressure.

We briefly note the stylised facts in Section 2. The elemental economics is discussed in Section 3 and the deflationary forces investigated in more detail in Section 4. Future consequences are considered in Section 5, drawing on some economic modelling the spirit of which is described but the details of which are provided elsewhere. Section 6 concludes.

2. The Stylised Facts

With the passing of real anchors in the early 1970s a period of financial volatility ensued with monetary policy targets in the advanced economies transitioning from gold and exchange rates through money aggregates to inflation rates.4 Throughout this period most central bank mandates attached weight to measures of real output and unemployment but their focus has been on a target range for inflation.5 As indicated in Figure 1, consumer price index (CPI) inflation rates in these advanced economies stabilised in the 1990s and have remained low ever since, though there is some sign that they have trended even lower very recently. Indeed, the corresponding rates of producer price inflation, while historically more volatile, show a marked dip into deflation since 2014. With this has come resurgent employment growth but with the notable absence of wage inflation, suggesting a clue as to the deflationary forces to be discussed in Section 4.

At the same time the declining trend in government bond yields, both of short and long maturity, has been dramatic and continuous, as shown in Figure 2.6 This is notwithstanding the very substantial fiscal deficits, which are larger relative to GDP than the advanced economies’ GDP growth rates. The associated rising trend in gross sovereign debt shown in

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4 In the developing world monetary policies have been dominantly focused on exchange rates against such currencies as the USS, though the IMF has been advising developing countries to transition to inflation targeting since the 1990s (Masson 1997) and increasing of such countries are now adopting inflation targeting (Amato and Gerlach 2002) and, like Australia, allowing substantial exchange rate movements against the USS.

5 This is formalized in the widely discussed Taylor Rule (Taylor 1993), though such formality is shunned by central banks in favour of discretion.

6 Note the brief inversion of Australia’s yield curve in the lead-up to the GFC, due to the inflationary effects of the boom in Chinese commodity imports and the Reserve Bank of Australia’s preference to see the exchange rate appreciate rather than to have it cause domestic inflation.
Figure 3 might otherwise be expected to drive up borrowing costs. The coincidence of falling government borrowing rates and continuing high fiscal deficits suggests a surge in the global demand for bonds issued by advanced country governments, and particularly, for those issued in the US. Prior to the GFC the culprits for this were the high-saving Asian economies (Arora et al. 2015) but, since then, the demand has been spurred by central bank buying of long-maturity assets following transitions to UMP in Japan then the US and the UK, and finally, in continental Europe. This triggered wider private interest in long maturity government debt, leading to what has been described as a “bond bubble” (Krishnamurthy and Vissing-Jorgensen 2012, Maley 2016, Price 2016).

3. The Elemental Macroeconomics

Slowing inflation in the advanced economies is one of the focal symptoms of “secular stagnation”, which is seen to be driven by a trend toward declining perceived rates of return on investment in the advanced economies. It is common to see the underlying determinants of this change as having demographic elements, such as the effects of the post-war baby boom in the advanced economies, which saw high rates of capital accumulation and slower natural population increases (Lee and Mason 2010, Gagnon et al. 2016). This slowing of demand growth as populations and urban infrastructures have stabilised has been laced with unusual pessimism and perceived risk, with portfolios shifting to economies in transition in search of more substantial and reliable yields.

Consider the effects of such a negative shock to expected rates of return in the abstract. It needs have no immediate effect on output but economic investors issue less debt or equity and so asset supply growth is curtailed and asset prices rise. Long maturity yields fall, along with the volume of economic investment. This reduces the opportunity cost of holding money in the collective portfolio and there is a rise in the demand for real money balances. With yields lower, households and firms prefer to hold a stock of liquid assets that has increased purchasing power over goods at current prices. One possible resolution is that there is a rise in the price of money relative to goods, the supply of which adjusts little in the short run. This implies a fall in the price of goods relative to money: a fall in the price level (a change in the exchange rate between money and goods that cheapens goods in terms of money).

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The alternative resolution is for the central bank to make money more abundant via a policy-induced expansion in the monetary base. Thus, there is either a deflation or a monetary expansion, the latter implying, conventionally, a decline in the nominal short interest rate. Because deflation, in the presence of nominal wage rigidity, makes hiring unattractive and weighs negatively on investment incentives, central banks prefer to engineer monetary expansions.\(^8\) The consequences for the yield curve are declines in asset yields, engineered at the short end by central banks and occurring at the long end due to reduced incentives to invest.\(^9\) Real net investment slows and, because new technology is embodied in it, so also does productivity. Overall, economic performance slumps.

Should the pessimism shocks be more general than merely those affecting investment, such as where households anticipate a decline in their real disposable incomes and hence reduce current consumption, the results are similarly directed but much worse. Increased private saving further inflates asset prices and reduces long maturity yields and there is a larger expansion in portfolio money holding. If, beyond this, future deflation is anticipated, then the outcome is yet worse. Real demand for portfolio money rises and the monetary expansions required of central banks are much larger.\(^10\) Moreover, if perceived risks cause financial institutions to hold larger liquidity reserves and households to mistrust those institutions and so hold cash, lending by financial institutions declines and the monetary expansion required is even larger still.

It is when central banks face difficulty in realising large expansions under such circumstances, usually because short rates are approaching the zero lower bound (ZLB), that the effect is reduced inflation and the threat of deflation. Clearly, since the GFC, this offers at least a partial explanation as to why the major central banks were forced to resort to UMP. The moment central banks entered the markets for long maturity assets they became net acquirers of long maturity bonds and related assets, accumulating large portfolios. This

\(^8\) This implies traditional Phillips curve behavior and, by contrast with much of the recent literature employing real business cycle and new Keynesian models, downward rigidity of wages and involuntary unemployment. See Bewley (1999) and Malley et al. (2005) for supporting evidence.

\(^9\) The tendency for bond yield curves to slope upward (the term premium) is driven by liquidity preference but, importantly, we see the short maturity market as segmented from the long maturity market by transaction costs and institutional alignments (Johnson et al. 2010). The consequence of this is that central banks and large domestic financial institutions trade at the short end while the financing of most private investment occurs at the long end. Moreover, it is long instruments that are traded internationally, the yields on which depend on global saving and investment, crudely following trends in a Wicksellian (1898) natural rate of interest at the global level.

\(^10\) This is one justification for the considerable significance that is attached to inflation expectations in applied macroeconomics. The estimated trend in these expectations in the advanced economies has been downward, as concluded by Grishchenko et al. (2016).
stimulated private demand, raising asset prices and reducing yields. Because arbitrage is strong between the markets for long maturity assets issued in the advanced economies, yield curves were suppressed globally.

Much of the concern expressed over this by Summers (2016) and others has been its effect on the power of central banks to stabilise economic performance about a natural growth path, which can also be interpreted as to keep inflation in the positive range, thus reducing the risk of slipping into deflation. Past US recessions have been resolved via monetary expansions that have seen short interest rates decline by an average of five percentage points (The Brookings Institution 2018). Scope for this does not exist today. Other stimulatory policies are therefore widely discussed. Borrowing by governments to finance additional public expenditure, for example, reduces total global saving, reducing asset price inflation and mitigating the decline in real long yields. If that additional expenditure is on public infrastructure or R&D, it also has the effect of raising the private rate of return on associated new physical capital, which stimulates investment demand, further mitigating the decline in real yields and taking the pressure off central banks to continue expanding. Moreover, such investments by governments also have the potential to accelerate underlying real growth.

It is therefore with good reason that there is emphasis in international fora on public investments in countries that have “fiscal space”, combined with return-enhancing structural (including trade) reforms (Summers 2016, Lagarde 2016). But therein lies the rub. As Figure 3 indicates, few advanced economies have “fiscal space”. An alternative, now implemented in the US and the UK, is a reduction in the corporate tax rate. This is indeed stimulatory, but it is “beggar thy neighbour”, attracting investment at the expense of other economies in the short run. When the race to the bottom on company tax is complete the first-movers have built new capital but fiscal space is reduced everywhere and the problem of deflationary forces remains unaddressed.

4. Deflationary Forces

11 Central bank asset holdings increased markedly during the UMP period. Because conventional monetary policy manages the mainly domestic markets for short term government debt, it is rare for their portfolios to be more than a few per cent of GDP. During the UMP period the assets of the Bank of Japan rose to half of Japanese GDP, while those of the US Fed and the European Central Bank rose to a fifth of their GDP levels (Taylor and Tyers 2017).
12 Note from Figure 1 that, while short rate cuts of five percentage points have been required during the last three major recessions, the cuts required in Europe, Japan and Australia have been substantially smaller.
13 The existence of “fiscal space” in Australia is debatable, since while its sovereign debt is lower than other advanced economies, it is rising at a faster rate.
Deflation follows whenever there is a boost to the supply of goods that is not matched by a corresponding boost to the money supply sufficient to finance the needed transactions. But it can also occur in response to circumstances that raise the attractiveness of money as a portfolio asset, such as when pessimism about future income or returns is pervasive. In all cases, the essential feature is that central banks are in some way perceived as constrained from accommodating monetary expansions, such as by proximity to the ZLB and considering the relative unattractiveness of UMP.

4.1 Demand side determinants:

*Portfolio money holding:* Post GFC there has been an increase in portfolio demand for money due to perceived risk and deflationary expectations (Tyers 2015a, Shiller 2017). Much of this is held by financial institutions and redeposited with central banks, inflating their monetary bases. A further contribution arises from the immense growth in the big five information US technology (IT) firms in terms of profitability and scale on global equity markets. Strangely, they have retained substantial strange offshore money holdings, amounting to at least US$ three trillion (*The Economist* 2017a). This is partly in anticipation of US tax reform, though their motivations are not well understood. The key issue is that this money does not finance transactions, but it has bolstered demands on central banks to continue expansions.

*Suppression of consumption and the productivity catch-up in China:* This was very important during the decade and a half following China’s major economic policy reforms in 1994. Unprecedented economic growth rates coincided with saving rates out of GDP that exceeded 50 per cent. This had two major effects. First, it led to substantial current account surpluses that constituted a surge in the excess supply of Chinese manufactured goods to the advanced economies. Accelerated monetary expansions were required to prevent this causing deflation in the advanced economies during this period. Second, the Chinese excess saving raised the prices of, and reduced the yields on, long term bonds issued by the advanced economy governments. These changes quickly arbitragéd into all asset markets in these economies. Since 2010, however, Chinese consumption expenditure has grown faster than GDP and financial outflows, at least for a time, were dominated by private and corporate foreign investments, rather than by reserve accumulation. Capital controls have very recently stemmed this flow and the current account surplus has declined as a share of GDP, thus reducing the external effects of Chinese development in the advanced economies.

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14 See the reviews of the net effects of East Asian growth on the advanced economies by Arora et al. (2015) and Tyers (2015).
The rich in the advanced economies have got richer: The onset of globalisation after the 1970s and the coincident expansion of labour-saving technology have enriched capital owners, whose portfolios are now global. At the same time, the shares of consumption expenditure in the incomes of capital-owning households are low, yet incomes to working households in the advanced economies, whose propensities to consume are high, have stagnated. Because demand sourced by the groups that have high consumption shares of income has slowed, so also has the growth of overall demand (Tyers and Zhou 2017), reducing the price of goods relative to money.

The race to the bottom on capital income tax: this exacerbates the inequality effects mentioned above but, further, it (and its prior anticipation) draws in investment from the rest of the world to reforming economies, which temporarily appreciates their exchange rates and so suppresses growth in their consumer price levels (CPIs).

Expenditure on poorly measured IT related services: This has increased, constraining measured demand. It represents, at the very best, an unobserved productivity increase that is not matched by monetary expansion and so is deflationary (Kavuri and McKibbin 2017).

4.2 Supply side determinants:

Generic economic growth: Where the pace of output growth exceeds that of the money supply deflation is a widely accepted consequence. Indeed, many classical economists considered deflation due to economic growth to be acceptable. Marshall, Edgeworth, Giffen, von Harberler and von Hayek all supported a “productivity norm” by which rises in productivity would bring about a declining price level (Bagus 2015). Keynes’ introduction of the idea of nominal rigidities led to this becoming less popular after the great depression. In any case smooth growth in output need not change the terms under which central banks conduct their open market operations in order that correspondingly smooth expansions in monetary bases should occur.

Net immigration to the advanced economies: The greater parts of the population increases over the past decade in Australia, Canada, the US and Europe have been due to net immigration from the developing world. This has led to surges in the supply of labour, particularly in Australia, and helped to avoid wage inflation. These changes are clear in the cases of Australia and Europe from Figure 4. While these surges have bolstered GDP growth, particularly since the GFC, they have led to stagnation in per capita terms, as
indicated in Figure 5. The exceptions in this period were Germany and Japan, neither of which accepted many migrants during the period plotted yet both of which showed continued growth in per capita terms.

**Global value chains and foreign value added:** A key component of the effects of globalization on trade is the fragmentation of production and the outsourcing of component supply where this is made advantageous by wage rates, environmental protection or company tax liabilities. Once consequence of this in the advanced economies is that the domestic value added share of the gross value of output declines. This can be seen as a general trend in the foreign value added shares shown in Figure 6. Importantly, the demand for money to finance transactions depends on gross output, since intermediate products and components must also be transacted domestically. Yet the income driving final demand depends on domestic value added, the main component of GDP. The result is a surge in the transactions demand for money relative to GDP growth, and this is deflationary.

**Unanticipated global fossil fuel surplus:** The dip in commodity prices starting in 2014 was led by petroleum, as energy demand growth contracted globally and the Chinese economy slowed. At the same time, global reserves of natural gas and shale oil emerged as sufficient to meet total energy demand for the foreseeable future, while the march of renewable energy technologies continued.

**Moore's Law and accelerating automation:** Technical change in the global IT sector continues apace. Yet growth in total factor productivity (TFP) stagnated in the OECD after 2005 in what has become known as the “Solow Paradox”. Eventually, the tech transformation that we are seeing will defy this paradox and appear in the statistics, driving accelerating investment and capital growth, along with production capacity. This will require substantial monetary expansions to avoid deflation. But the effect of this substantial change goes beyond TFP. Throughout the advanced economies the last two decades have seen continuous declines in the value added share of low-skill labour. Prior to 2005 the declines in the low-skill shares were largely offset by rises in skill shares. Subsequently, however, the substitution was between low-skill labour and capital, defined generally to include intangible capital. This change of trend is redistributing income away from low-income households, who consume most of their income, to upper professionals and most recently to capital.

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15 Acemoglu et al. (2016) note Robert Solow's comment in his 1987 *New York Times Book Review* article: “... what everyone feels to have been a technological revolution, a drastic change in our productive lives, has been accompanied everywhere, including Japan, by a slowing-down of productivity growth, not by a step up. You can see the computer age everywhere but in the productivity statistics.”
owners, who consume smaller shares of their income and whose saving goes to global portfolios.\textsuperscript{16}

\textit{US leadership in automation:} When the capital share of value added rises first in the US, it raises the after tax net rate of capital return there, relative to that in the other advanced economies, drawing in investment from the rest of the world and appreciating the USD, again this tends to reduce the US home consumer price level.

5. Future Deflationary Forces

There are signs that some of the deflationary forces operating in recent decades have run their course. As strategic bilateralism rises with the resurgence of “great power competition” and in the advanced economies, populist politics, the effects of outsourcing and the components trade might be expected to abate. Indeed, changes in technology have effectively ended the era in which developing countries with large low-skill populations can adopt the “East Asian model” and expand rapidly via a period of specialization in low-skill intensive manufacturing. As a consequence, growth performance in these economies will depend on investment that is driven more by great power rivalry than by gains from trade. For many, this will mean that growth prospects will be leaner and that larger numbers of their citizens will seek to migrate to the advanced economies, formally or informally. Thus, while the effects of outsourcing on price levels will abate, those of migration could increase markedly.

With the passing of China’s growth surge, the suppression of China’s consumption expenditure has ended and the associated excess supplies to the advanced economies are a thing of the past. Moreover, with the slowing of Chinese imports a period of relative stability of commodity prices is likely. Many forces will come into play, including the rise in tech based output, through its effects on energy production and its mix of commodity demands. Business cycles in the advanced economies and Middle Eastern political instability will play roles but these sources are unlikely to further supply a persistent and accelerating deflationary force.

Likely to continue are the race to the bottom on capital income tax and labour saving technical change, both of which will advantage high-income households more than workers and so constrain the growth in domestic consumption demand. To obtain a preliminary assessment of the deflationary forces that are likely to continue, we have constructed a model

\textsuperscript{16} See Tyers and Zhou (2017) for a review of these changes and an analysis of their distributional consequences.
of the global macro-economy.\textsuperscript{17} We use the model to simulate the effects of the three main deflationary forces we believe are likely to be sustained or to increase in the future.

5.1 The Model

A multi-region general equilibrium structure is used that centres on the global financial capital market. It is assumed that the financial products of each region are differentiated and that portfolio managers assign new net saving across regions so as to maximise expected portfolio returns given this differentiation. Although there is a tendency for financial flows to move the global economy toward uncovered interest parity, in the length of run considered asset differentiation leaves this process incomplete. At the same time, expected rates of return depart from regional bond yields, the latter reflecting short run equilibria in regional financial markets, as between savers, indebted governments and investors.

Within each region the demand for money is driven by a “cash in advance” constraint applying across the whole of GDP. For any one household, home money is held in a portfolio with long maturity bonds, which are claims over physical capital, combined with home and foreign long maturity government debt, and so the opportunity cost of holding money is the long yield. On the supply side of the money market, the proportion of expansions that occur via the purchase of long maturity assets (UMP) is parameterised. Conventional expansions directly affect the money supply while UMP expansions affect both it and the long end of the yield curve. UMP expansions raise home long maturity asset prices and lower long yields, causing imperfect spill-overs due to global arbitrage that is only partially constrained by asset differentiation.\textsuperscript{18}

Six regions are identified: the US, the EU, Japan, China, Australia and the Rest of the World.\textsuperscript{19} Each region supplies a single product that is also differentiated from the products of the other regions and this product is both consumed directly and used as an intermediate input, both at home and abroad. On the supply side, there are three primary factors with low-skill labour a partially unemployed variable factor while the stocks of physical capital and

\textsuperscript{17} The model is a development of that used by Tyers (2015, 2016), which incorporates trade in intermediate inputs and multiple households for distributional analysis.

\textsuperscript{18} By contrast, conventional monetary policy involves trade in short term instruments which has no direct impact on the market for long term bonds. Short rates are therefore not modelled explicitly, rather the monetary base in each region is determined as endogenous to the target of monetary policy and an exogenous parameter determines the share of any change in the monetary base that takes the form of long asset balance sheet expansion.

\textsuperscript{19} The EU is modeled as the full 26 and it is assumed that this collective has a single central bank.
skill are exogenous and fully employed. Collective households are net savers with reduced form consumption depending on current and expected future real disposable income and the home interest rate.

5.2 Simulating the Deflationary Forces

To illustrate the comparative power of the deflationary forces we anticipate continuing, we impose migration flows, a capital tax race to the bottom and labour saving technical change as stylized shocks to the global economy. These shocks all tend to redistribute income away from workers and toward capital owners in the advanced economies and this redistribution is partially responsible for the financial consequences that emerge. We focus here, however, on the two principal financial effects. First, we simulate price level targeting central banks in the advanced economies and so measure deflationary effects by the scale of monetary expansions needed to sustain targets. Second, we observe the effects of the shocks on the long maturity bond yield, declines in which have contributed to constraining conventional monetary policy and, recently, are the partial consequences of transitions to UMP. These results, and the details of the simulations from which they come, are summarized in Table 1.

All three forces considered require force-specific monetary expansions, though magnitudes vary by force and across regions. Because the shocks are stylized and they represent uncertain projections, there is some danger in comparing their simulated effects. But the monetary implications of the migration shocks appear to be strongest in all regions. These suppress real wage costs and boost the incomes of capital-owning households whose additional saving causes downward pressure on the global “natural” rate of interest. Notably, these effects are even substantial in Japan and China, which do not receive migrants. These effects are due to global integration through trade and financial flows, and in China’s case the assumption that its monetary target is its exchange rate with the US$.

Next largest are the effects of continuing technical change that reduces low-skill labour shares. This also reduces real wage costs and redistributes income to high-saving capital-owning households. Again the rise in saving by these households reduces interest rates globally. No government intervention is assumed to address the increases in inequality that emerge. The wage rates of low-skill workers fall, as to the incomes of their households.

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20 In general we recognise that price level targeting differs in method and effect from the more commonly implemented inflation targeting. As we model it, however, the underlying growth path of the economy is static and so price level targets are more natural representations.
Clearly, transfer regimes like the “universal basic income” or the “earned income tax credit” could address this and therefore significantly reduce the deflationary pressures that result (Tyers and Zhou 2017). Finally, the race to the bottom on capital income tax rates causes significant but smaller deflationary pressure and declines in long yields. This is due in part to the assumption in the simulation that this policy change occurs over 10 years in all regions by the same magnitude. Moreover, the loss of future government revenue from reduced capital taxation is assumed, eventually, to be made up via consumption taxes, which offset deflationary effects.

6. Conclusion

The monetary expansions required to keep pace with the three prospective deflationary forces considered here, namely migration, capital tax rate reduction and labour saving technical change, amount to around four per cent per year. This is in addition to expansions required due to growth in underlying real output and transactions demand. By redistributing income to high-saving households, the three prospective forces also reduce long interest rates by around three per cent per year. All of this suggests that the constraints on the stabilizing role of monetary policy that stem from these deflationary forces are unlikely to disappear soon.

Future macroeconomic stabilisation around growth trends in the advanced economies will depend on how governments address the distributional effects of accelerating immigration, as well as tax and technical changes that are fostering inequality. Competing ideas include the universal basic income, the popularity of which is rising in Europe, and the earned income tax credit, which originates from the US. While the earned income tax credit appears to offer better outcomes, mainly because it maintains higher levels of employment and output, both will require more “fiscal space” than is currently available in the advanced economies. This, in turn, will require transitions to more indirect taxation regimes that will, at least temporarily, be inflationary. The race to the bottom under way on capital income taxation will advantage all households in first movers but capital-owning households disproportionately. Eventually, it will reduce fiscal space. A redistribution of the taxation burden toward indirect taxes seems to be an essential development on the horizon, particularly in North America and Japan but also in Australia.

Ironically, today’s low rates, for short maturity as well as long maturity assets, stem at least in part from conventional monetary policy failure, expanded central bank balance sheets and
the resulting global “bond bubble”. Future monetary policy effectiveness as deflationary forces continue will depend on financial market “normalisation” in the advanced economies. This requires the phasing out of UMP in Europe and Japan and the drawing down of balance sheets by their central banks and the US Fed, which will allow long maturity yields to rise. This rise will then provide room for the normalisation of short rates and the restoration of effective conventional monetary policy.

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**Figure 1: Annual Inflation Rates**

Consumer price growth

![Inflation Rates Chart](chart1.png)

Producer price growth

![Inflation Rates Chart](chart2.png)


**Figure 2: Government Bond Yields**

3 months

![Government Bond Yields Chart](chart3.png)

10 years

![Government Bond Yields Chart](chart4.png)


**Figure 3: Fiscal Deficits and Sovereign Debt**

Deficit to GDP Ratio

![Fiscal Deficits Chart](chart5.png)

Gross Sovereign Debt to GDP Ratio, %

![Sovereign Debt Chart](chart6.png)

Figure 4: Population Growth in Europe and Australia (% per year)

Europe


Australia

Source: OECD Employment and Labour Market Statistics.

Figure 5: Real Net National Product per Capita

(1990 US$)

Sources: Deflation is by CPI from IMF: World Economic Outlook. NNP values are from the OECD: National Accounts Statistics.
Figure 6: Foreign Intermediate Shares of Domestic Gross Output

Source: Calculated from the World Input Output Database, Timmer et al. (2015).
Table 1. Deflationary Forces: Simulated Monetary Expansions Needed and Long Maturity Bond Yield Changes\textsuperscript{a}

(Annual % change)

<table>
<thead>
<tr>
<th>Shock</th>
<th>Observed variable</th>
<th>USA</th>
<th>EU</th>
<th>Japan</th>
<th>China</th>
<th>Australia</th>
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<tbody>
<tr>
<td>Migration\textsuperscript{b}</td>
<td>Monetary base</td>
<td>2.43</td>
<td>2.12</td>
<td>0.90</td>
<td>2.31</td>
<td>2.55</td>
</tr>
<tr>
<td></td>
<td>Real long bond yield</td>
<td>-1.57</td>
<td>-1.64</td>
<td>-1.38</td>
<td>-1.32</td>
<td>-1.58</td>
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<td>Company tax rate reduction\textsuperscript{c}</td>
<td>Monetary base</td>
<td>0.08</td>
<td>0.11</td>
<td>0.02</td>
<td>0.29</td>
<td>0.06</td>
</tr>
<tr>
<td></td>
<td>Real long bond yield</td>
<td>-0.41</td>
<td>-0.39</td>
<td>-0.42</td>
<td>-0.49</td>
<td>-0.37</td>
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<tr>
<td>Labour saving tech change\textsuperscript{d}</td>
<td>Monetary base</td>
<td>1.27</td>
<td>1.48</td>
<td>1.04</td>
<td>1.58</td>
<td>1.34</td>
</tr>
<tr>
<td></td>
<td>Real long bond yield</td>
<td>-0.98</td>
<td>-0.96</td>
<td>-1.06</td>
<td>-1.00</td>
<td>-0.95</td>
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\textsuperscript{a} These changes in monetary bases and long bond yields arise from a global model simulation in which migration, company tax rate and technical change shocks are imposed. Price level targeting monetary policy regimes are assumed to be maintained in all regions except China and the “rest of the world”, which target their US$ exchange rates, and the results shown are specific to the nominated shocks only. Positive growth in monetary bases indicates the expansions required in order to sustain the targets, showing the strength of the associated deflationary forces. No underlying growth process is included but the capital flows and capital stock adjustments that occur in response are included.

\textsuperscript{b} The migration shock raises the low-skill labour forces of the US, the EU and Australia by 1.0 %/year and their skilled work forces by 2.0 %/year, with this labour coming from the “rest of the world”.

\textsuperscript{c} The company tax shock is a one-off, uniform reduction in the power of the capital income tax rate, in all regions, by 5.0 %, implemented over 10 years. Lost government revenue is assumed to be made up via increases in consumption tax rates. Results for a US only shock are more modest, though the US deflationary force is stronger due to exchange rate appreciation. These results are available on request.

\textsuperscript{d} The technical change shock is a fall in the low-skill labour share of total value added in each region by 1.53 %/year, which is the rate at which the share in the US has decline during the past two decades (Tyers and Zhou 2017). This rate is here imposed in all regions without any associated changes in TFP.
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