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Sophia Latsos

**Real Wage Effects of Japan's Monetary  
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## **Real Wage Effects of Japan's Monetary Policy**

Sophia Latsos\*

University of Leipzig  
Institute for Economic Policy  
Grimmaische Straße 12  
04109 Leipzig  
[latsos@wifa.uni-leipzig.de](mailto:latsos@wifa.uni-leipzig.de)

### Abstract

This paper examines real wage effects of monetary policy in Japan, particularly during the past two decades of monetary easing. The literature generally attributes real wage trends to structural factors that influence the nominal wage components, such as the disappearance of downward nominal wage rigidity. The contribution of this paper is twofold. First, it offers a theoretical framework for the transmission of monetary policy shocks to real wages, emphasizing the responsiveness of labor productivity growth to monetary expansion. Secondly, it alludes to the significance of real wage effects of monetary policy for optimal policy design.

JEL-Code: E520, E580, E240.

Keywords: Japanese monetary policy, Bank of Japan, monetary easing, policy effects, real wages, monetary transmission channels.

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## 1. Introduction

Given more than two decades of a depressed economy amid very low interest rates, Japan's policy makers seek to revive the economy with unconventional monetary policy, including quantitative and qualitative easing (QQE), a negative interest rate, and yield curve control. As these measures aim to raise inflation, policy makers hope to shift up inflation expectations, which shall lead to sustained wage growth and spur aggregate demand. Yet, Japanese (real) wage and inflation trends have not responded to these policy aims.

Japanese nominal and real earnings have declined during the past two decades, while inflation has remained subdued. Empirical research attributes these wage trends to structural factors that affect nominal wages negatively. After the burst of the bubble economy, labor market duality increased and downward nominal wage rigidity disappeared (Yates, 1998; Kimura and Ueda, 2001; Tachibanaki, 1991; Kuroda and Yamamoto, 2003 and 2007; Kodama et al, 2015). Foreign competition and technology seems to have affected nominal wages negatively (Sommer, 2009). The aging population seems to have had a negative composition effect on wages, although empirical evidence in this context is sparse and ambiguous (Sommer, 2009; Steinberg and Nakane, 2011; Aoki, 2012; Fujita and Fujita, 2014).

Theoretically, the impact of monetary policy shocks on real wages is indeterminate. In New Keynesian models, expansionary monetary policy has a positive effect on real wages according to the assumptions about nominal rigidities (Evans, 2001; Christiano et al., 2005). The Barro-Gordon model shows that monetary expansions have a negative effect on real wages in the short run if inflation takes trade unions by surprise (Barro and Gordon, 1983). The Austrian School suggests a negative effect of monetary policy on real wages after a low-interest rate induced boom has become unsustainable (Hayek, 1976 [1929]); Wicksell, 2005 [1898]; Mises, 1998 [1949]). Neither one of the existing theoretical models analyzes the long-run transmission between persistent monetary expansions and real wages.

Although policy makers have started to question the link between expansionary monetary policy and real wages<sup>1</sup>, few empirical studies analyze this link explicitly. Research within the New Keynesian framework provides mixed evidence for the response of real wages to monetary policy shocks (Normandin, 2006; McCallum and Smets, 2007). Research on redistribution effects of monetary policy does not include real wage effects. Saiki and Frost (2014) suggest that expansionary unconventional monetary policy has a negative effect on the income and

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<sup>1</sup> See FT (2014), Nikkei Asian Review (2015), BoJ (2015), CNBC (2017), or FT (2017) for Governor Kuroda's (BoJ) remarks.

wealth distribution in Japan due to its positive effect on asset prices. Inui et al. (2017) question an effect of expansionary unconventional monetary policy on Japanese income inequality, but do not account for monetary effects on real wages of different income groups.

Based on the Japanese experience with prolonged monetary easing, this paper argues that expansionary monetary policy can have negative real wage effects. Such effects can come along with negative distribution effects on household income and consumption, which in turn can affect aggregate demand, economic growth, inflation (expectations), and savings. The contribution of this paper to the literature is twofold. First, it offers a theoretical framework for the transmission of monetary policy shocks to real wages, emphasizing the responsiveness of labor productivity growth to monetary expansion, particularly in the context of the allocation and signaling function of the interest rate. Secondly, it alludes to the significance of real wage effects of monetary policy for optimal policy design.

## **2. Real wage effects of monetary policy in theory**

The theoretical literature discusses real effects of monetary policy in the context of the short- and long-run neutrality of money so that real wage effects are the result of non-neutral money. In Keynesian economics and New Keynesian models, expansionary monetary policy affects real wages due to nominal rigidities in wages or prices. Hence, the effects of expansionary monetary shocks depend on the modeling assumptions regarding nominal rigidities. The Barro-Gordon model suggests that expansionary monetary policy affects real wages negatively in the short term due to an inflation bias, which is a result of discretionary monetary policy amid rational agents. Austrian theory accredits monetary-policy induced business cycles for negative effects of expansionary monetary policy on real wages.

### **2.1 Classical economics, Keynes and the Barro-Gordon model**

Classical theory postulates that monetary policy does not have any real effects since nominal prices, interest rates and wages are flexible. A monetary expansion does not affect real wages since nominal wages and prices adjust. The interest rate declines, leading to a temporary increase in investment, aggregate demand, and real GDP. Real money balances rise, as prices initially remain constant while credit supply increases. Labor supply is constant so that firms increase nominal wages to compete for scarce labor. Faced with higher wage costs, firms have to increase their prices. They also reduce their supply in response to decreasing demand. Real GDP returns to its equilibrium level, while the price level adjustments offset nominal wage

increases (Smith, 1904 [1776]; Mill, 2009 [1848]). Thus, real wages remain constant in response to a monetary expansion.

This monetary neutrality in classical economics precludes a direct link between real wages and monetary policy. An expansionary monetary shock disturbs the market equilibrium only temporarily. In this spirit, the quantity theory of money postulates that the supply of money is proportionate to the price level (Fisher, 1892 and 1922 [1911]).<sup>2</sup> Given a constant velocity of circulation ( $V$ ), the price level ( $P$ ) increases if money ( $M$ ) grows beyond output ( $Y$ ). As wages and interest rates are flexible and adjust after an initial shock, monetary policy does not affect real wages. The market returns to equilibrium, and the monetary policy intervention is ineffective.

Moreover, neoclassical economics establishes a direct positive relationship between real wages and labor productivity in a competitive market (see Mankiw, 2009). The relationship stems from the Cobb-Douglas production function, which relates output  $Y$  (of firms) to the input factors capital  $K$  and labor  $L$  as well as a parameter  $A$  that represents the productivity of the available technology. It follows that

$$Y = F(K, L) = AK^\alpha L^{1-\alpha}, \quad (1)$$

where  $Y$  is a function of  $K$  and  $L$ . Additionally,  $A, K, L > 0$ , and  $0 < \alpha < 1$ . In a competitive market, a profit-maximizing firm demands labor until the marginal product of labor ( $MPL$ ), i.e. the additional unit of output from an additional unit of labor input, equals the real wage ( $\frac{w}{p}$ ), i.e. the cost of hiring an additional unit of labor adjusted for the price. It follows that

$$\frac{w}{p} = MPL = (1 - \alpha)AK^\alpha L^{-\alpha} = (1 - \alpha)Y/L. \quad (2)$$

Accordingly, the  $MPL$  is proportional to output per worker ( $Y/L$ ), i.e. the average labor productivity. If  $MPL > \frac{w}{p}$ , a profit-maximizing firm would want to employ more labor, while workers would bargain for higher wages or search for higher paid employment. If  $MPL < \frac{w}{p}$ , real wages are above labor productivity and a competitive firm would reduce the number of employees accordingly. Thus, real wages move in line with labor productivity growth (Blanchard and Katz, 1999).

In contrast to neoclassical theory, Keynesian models generally contend the notion that markets clear in the short-run. Accordingly, unemployment rises due to insufficient aggregate

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<sup>2</sup> The Quantity Theory of Money states that  $MV = PY$  so that the amount of money times the velocity of circulation equals total spending (the average price level times the volume of transactions of goods and services).

demand, and not because of workers refusing to accept a wage corresponding to their marginal productivity. Short-run real effects of monetary policy emerge due to nominal rigidities, and only subside in the long run, once nominal variables adjust.

Hence, Keynesian theory sees a need for government intervention to stimulate aggregate demand and reduce unemployment in the short-run (Keynes, 1937). Accordingly, during a recession, debt-financed expansionary fiscal policy stabilizes the economy. Expansionary monetary policy neutralizes the crowding-out effect of fiscal expansion. It has a positive effect on aggregate demand as loanable (bank) funds increase, interest rates fall and investments, consumption, and real GDP rise. In turn, this reduces unemployment. Yet, if the policy rate reaches the zero-lower bound, expansionary monetary policy is ineffective and fiscal policy must counter a recession (liquidity trap).

Yet, these Keynesian short-run expansionary monetary interventions that counter unemployment also affect real wages. This is a result of nominal rigidities, such as sticky nominal wages. In particular, Keynes models assume that nominal wages are more rigid than prices so that changes in prices lead to changes in real wages. If prices increase, real wages decrease, which in turn stimulates employment (Keynes, 1937). Thus, an expansionary monetary shock stimulates employment in the short-run, at the expense of real wages.

It follows that monetary policy faces a constant trade-off between inflation and unemployment as modelled by the Phillips curve (Phelps, 1968):

$$U = U^N - b(\pi - w), \quad (3)$$

where  $b > 0$ . Unemployment ( $U$ ) in the economy depends positively on the natural or structural rate of unemployment ( $U^N$ ), which prevails in the steady state. It depends negatively on the difference between inflation ( $\pi$ ) and workers' wage demands ( $w$ ), which reflect the change in the wage costs of firms. Following an expansionary monetary policy shock, prices rise more quickly than wage costs ( $\pi > w$ ) and firms increase their demand for labor so that unemployment declines as real wages fall.

In the 1970s, however, unemployment remained high despite high inflation (*stagflation*), and economists called the Phillips curve relationship into question. Lucas (1976) criticized that rational economic agents anticipate policy actions so that rational expectations prevent effects of monetary policy on real economic activity in the long run. Accordingly, Friedman (1968, 1970) and Phelps (1967, 1968) discarded the trade-off between unemployment and inflation

and introduced expected inflation into economic modeling. As soon as monetary policy follows a systematically expansionary path, workers adjust their inflation expectations ( $\pi^e$ ) and, equivalently, their wage demands ( $w$ ). Consequently, the expectations-augmented Phillips Curve reads:

$$U = U^N - b(\pi - \pi^e), \quad (4)$$

where  $w = \pi^e$ .

The Phillips Curve relationships are in line with monetary theory, which postulates short-run non-neutrality of money as described in the short-run Phillips Curve (see (3)), and long-run neutrality of money as described in the expectations-augmented Phillips Curve (see (4)). In the short-run, monetarist theory predicts that expansionary monetary policy temporarily reduces unemployment due to nominal (wage) rigidities. This creates downward pressure on real wages. In contrast to Keynesian theory, these are not institutional rigidities, but stem from the dependence of the labor supply on real wages and permanent income. In the long run, inflation expectations enter wage bargaining so that monetary shocks can be anticipated. Thus,  $\pi = \pi^e (= w)$  and  $U = U^N$  (see (4)). The negative Phillips Curve relationship is not stable in the long run, but becomes vertical (Friedman, 1970; Phelps, 1967).<sup>3</sup>

Thus, monetarist theory cautions against prolonged, expansionary monetary policy, as it does not stimulate employment. Instead, persistent inflation can affect real wages negatively, or fuel a wage-price spiral (Okun, 1970; Goodfriend and King, 1997; Romer and Romer, 1999). Following a rise in the money supply, aggregate demand increases as consumers have more money to spend on goods and services. In response, firms increase output, hiring more labor and increasing wages. This leads to an increase in costs and prices, which reduces real wages. This causes workers to demand higher wages during the next round of wage bargaining, inducing higher prices again. While this vicious spiral unfolds, the increased economic uncertainty leads to lower investment and growth.

Therefore, monetary theory postulates rule-based instead of discretionary monetary policy. This relates to the time inconsistency problem of economic policy (Kydland and Prescott, 1977 and 1982). Discretionary monetary policy changes are ineffective if they seek to account for expectations since rational economic agents anticipate and circumvent such policies. Thus, if

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<sup>3</sup> Equivalently, the Quantity Theory of Money indicates that, given constant output and velocity of circulation, changes in the money supply cause inflation, or rather that the growth of the money supply equals the rate of growth of the price level.



the government pursues discretionary monetary policy, repeatedly expansionary monetary policy shocks lead to inflation that is higher than it would optimally be (inflation bias), since trade unions and workers adjust their wage claims to higher inflation so that wage-price spirals may emerge. This has a negative effect on real wages (Barro and Gordon, 1983).<sup>4</sup>

This inflation bias of discretionary monetary policy is part of the Barro-Gordon model. An expansionary shock raises current period inflation ( $\pi$ ) over target inflation ( $\pi^*$ ), which is the inflation that minimizes the loss for society.<sup>5</sup> Yet, as workers adjust their inflation expectations, current period inflation equals workers' inflation expectations ( $\pi^e$ ). Given  $\pi = \pi^e (= w)$  firms need not change their demand for labor so that the level of unemployment equals its natural rate ( $U = U^N$ ). Thus, while current period inflation increases above target, unemployment does not fall, and the expansionary monetary shock affects real wages negatively.

## 2.2 The Austrian School and New Keynesian models

The Austrian school questions the neutrality of money. In particular, expansionary monetary policy can have negative real effects (Hayek, 1976 [1929]; Wicksell, 2005 [1898]; Mises, 1998 [1949]). Monetary policy changes are only possible in response to changes in money demand or the velocity of money in circulation. Yet, if the money supply rises without these changes, relative prices change unexpectedly. In contrast to models that include rational expectations, this unanticipated inflation surprises agents.<sup>6</sup> Distorted relative prices in the capital market lead to overinvestment and a distortion of the production structure ( $I > S$ ).

Real wage effects of monetary policy are part of a business cycle. Following an unanticipated increase in the money supply, central bank and capital market interest rates fall below the natural interest rate, which is the equilibrium interest rate that balances supply (savings) and demand (investment) on capital markets (Hayek (1976 [1929]), Wicksell (2005 [1898]) and Mises (1998, [1949])). Previously risky investments appear more profitable as their financing costs have decreased. Bank credit rises and firms channel capital and labor into these investments, causing a misallocation of resources. They bid up nominal wages to attract additional labor. Aggregate demand rises as well as prices. The economy overheats with

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<sup>4</sup> Although past monetary policy research questions whether the concept of inflation bias squares with reality (see McCallum, 1995; Blinder, 1998), recent research agrees on the need to offset or reduce effects of inflation bias on the real economy (Cukierman and Gerlach, 2003). Empirical evidence in favor of the bias is robust to modifications (Pearcea and Sobueh, 1997; Cukierman, 2002; Surico, 2007; Anderson, Kim and Yun, 2010).

<sup>5</sup> The loss function for society would be  $L = (U - U^*)^2 + a(\pi - \pi^*)^2$ .

<sup>6</sup> Some market participants may anticipate this. Yet, the surprise shock breaches the trust in the monetary authority and future anticipation is impossible.

investments with returns that are lower than the natural interest rate. Owing to the increase of corporate profits, rapidly rising stock prices accompany investment growth. Real wages increase as nominal wages increase faster than prices.

Yet, once inflation accelerates, the central bank has to increase its policy rate. Thus, the misallocation of resources becomes apparent. At the turning point of the boom, demand for investments does not meet firms' expectations and eventually stalls, while input prices continue to rise. A 'cleansing effect' sets in, which constitutes of the clearing of malinvestments (Schumpeter, 1983 [1912]). Investments fall until the excess stock of physical capital is worked off. Firms release capital and labor from investments that are no longer profitable. Prices and wages decline. As nominal wages depend on wage negotiations between unions and employers, prices decline faster (Hayek, 1976 [1931]). This causes real wages to fall.

Recent studies provide evidence for the Austrian modeling framework. Borio et al. (2015) confirm resource misallocations that develop during economic booms, particularly misallocations of labor. Bordo and Landon-Lane (2013) find a positive effect of expansionary monetary policy on asset prices. Austrian overinvestment theory serves as ex-post explanation for the Japanese bubble economy (Koo, 2003; Schnabl, 2015), and increasingly for the recent US housing bubble (Leijonhufvud, 2009; Taylor, 2012; Morgenson, 2013; Torres, 2015).

New Keynesian models, which incorporate the Dynamic Stochastic General Equilibrium framework (derived from real business cycle theory), also reject the short-run neutrality of money. They analyze real effects of monetary policy in the context of nominal rigidities. Varying with the nominal rigidities included, there are three baseline or initial types of New Keynesian models: sticky prices, sticky wages, and limited participation.<sup>7</sup> Theoretical real wage effects of monetary policy in this framework vary with the assumptions made regarding nominal rigidities as summarized in *Table 1*.

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<sup>7</sup> Recent research introduces further nominal non-neutralities. These include, for example, coexisting staggered wage- and price-setting (Erceg et al., 2000; Woodford, 2003), sticky information (Mankiw and Reis, 2002; Reis, 2009; Coibion, 2010), habit formation (Christiano et al., 2005; Smets and Wouters, 2007), alternative labor market rigidities, such as real wage rigidities (Blanchard and Gali, 2007), and search and matching frictions (Trigari, 2004 and 2009).

**Table 1: Theoretical Implications of an Expansionary Monetary Policy Shock**

	Y (output)	L (labor)	W/P (real wage)	Y/L (labor productivity)
Sticky prices	↑	↑	↑	↓
Sticky wages	↑	↑	↓	↓
Limited participation	↑	↑	↑	↓

*Source:* Evans (2001).

First, the baseline New Keynesian model incorporates staggered nominal price setting (Fischer, 1977; Taylor, 1980; Rotemberg, 1982; Calvo, 1983). While nominal wages are fully flexible, nominal price rigidities (sticky prices) are due to frictions in the goods market that deter firms from adjusting prices immediately (Rotemberg, 1996; Woodford, 1996; Yun, 1996; Goodfriend and King, 1997; Clarida et al., 1999; Chari et al., 2000; Gali, 2003). An expansionary monetary policy shock raises aggregate demand. As prices are sticky, the increase in aggregate demand causes firms to increase output. They demand more labor so that nominal wages have to rise. Thus, an expansionary monetary policy shock raises real wages.

Secondly, New Keynesian models with nominal wage rigidities (sticky wages) relate to long-term implicit contract theory (Fischer, 1977; Taylor, 1979; Azariadis and Stiglitz, 1983). Prices are fully flexible, but frictions in the labor market prevent firms from adjusting nominal wages immediately (Bénassy, 1995; Ascari, 2000; Erceg et al., 2000; Gali, 2010). An expansionary monetary policy shock increases the price level, while nominal wages remain constant. Thus, real wages decline after an expansionary monetary policy shock.

Finally, New Keynesian models with limited participation relate to frictions in financial markets (Lucas, 1990; Fuerst, 1992; Christiano and Eichenbaum, 1995). A monetary shock does not initially affect all market participants to the same extent, depending on the degree of centralization of their financial transactions. An unexpected, expansionary monetary policy shock decreases the nominal interest rate.<sup>8</sup> This decreases the interest cost of financing wages so that nominal wages rise as labor demand increases, while prices remain constant. Thus, an expansionary monetary policy shock increases real wages.

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<sup>8</sup> This holds for a limited-participation model with a cost channel (Evans, 2001).

Hence, the real wage response to an expansionary monetary shock in the New Keynesian framework depends on assumptions regarding nominal rigidities. In line with this, empirical research also provides mixed evidence for the direction and extent of the real wage response to changes in monetary policy (McCallum and Smets, 2007). Most studies find that real wages rise (fall) following a monetary policy expansion (contraction) (Christiano et al., 1997 and 2005; Christoffel et al., 2006; Smets and Wouters, 2003; Normandin, 2006). Yet, Christiano et al. (2005) also show that the real wage increase in response to a monetary expansion is not very significant. Fewer studies find that real wages rise in response to monetary tightening (Sims and Zha, 1999; Bernanke et al., 2005; Peersman and Smets, 2003; Normandin, 2006).

The response of labor productivity to an expansionary monetary shock is negative in all three New Keynesian models (*Table 1*). Labor productivity falls as labor input rises more than output (Christiano et al., 1997; Bordo et al., 2000). In the model with sticky wages, falling labor productivity goes along with falling real wages. In contrast, in the models with sticky prices and limited participation, real wages increase despite declining productivity. This is at odds with classical theory, which requires labor productivity and real wages to move together.

Thus, theoretical and empirical real wage effects of monetary policy shocks hinge upon the assumptions made regarding nominal rigidities and are hence random. Empirical studies show that the effects of monetary expansions vary according to the different extent and persistence of the reaction of the interest rate, output, prices, wages and other labor market frictions (Sims, 1980; Sims and Zah, 1998; Evans, 2001; Peersman and Smets, 2003; Christiano et al., 2005; Normandin, 2006). As a result, research has begun questioning the derived causality between nominal rigidities and real effects of monetary policy. Peneva (2013, p. 3) notices that “there is almost no direct empirical evidence on whether nominal rigidities (...) are in fact the primary reason why nominal disturbances such as monetary policy shocks affect real activity”.

### **3. Monetary policy and real wages in Japan**

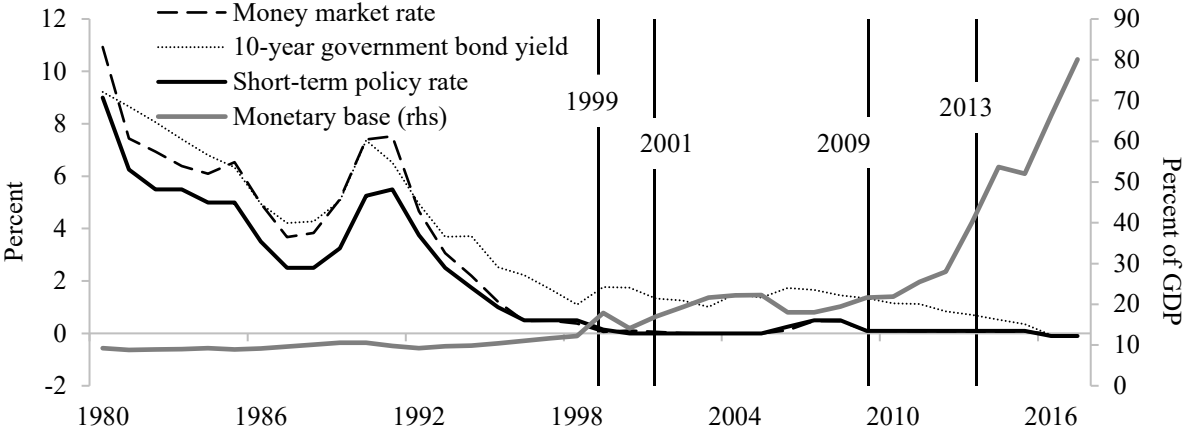
Conventional and unconventional monetary easing has dominated Japanese monetary policy for more than two decades. Since the late 1990s, real wages have followed a negative trend. Both phenomena have become the subject of extensive research. The literature has scrutinized Japanese monetary policy in terms of its potential real economic effects since the 1980s. Moreover, research discusses structural factors that have affected real wage

developments over time. Nevertheless, existing research has not explored the possible link between expansionary monetary policy and the negative real wage trend in Japan.

### 3.1 Monetary policy and real growth since the 1980s

Japan’s experience with expansionary monetary policy dates back to the 1980s. Due to frictions with the United States regarding the Japanese-US trade imbalance, the country came under pressure to revalue its currency (McKinnon and Ohno, 1997; Schnabl, 2015). Once Japan entered the Plaza Accord in September 1985, the yen appreciated far beyond its agreed target range by 50%. Japanese exports fell considerably, leading to a deep recession.<sup>9</sup> In order to soften the appreciation crisis, the Bank of Japan (BoJ) lowered its policy rate from 5% in September 1985 to 2.5% in September 1987, its lowest since the 1942 revision of the Bank of Japan Act (*Figure 1*).

**Figure 1: Japanese interest rates and monetary base**

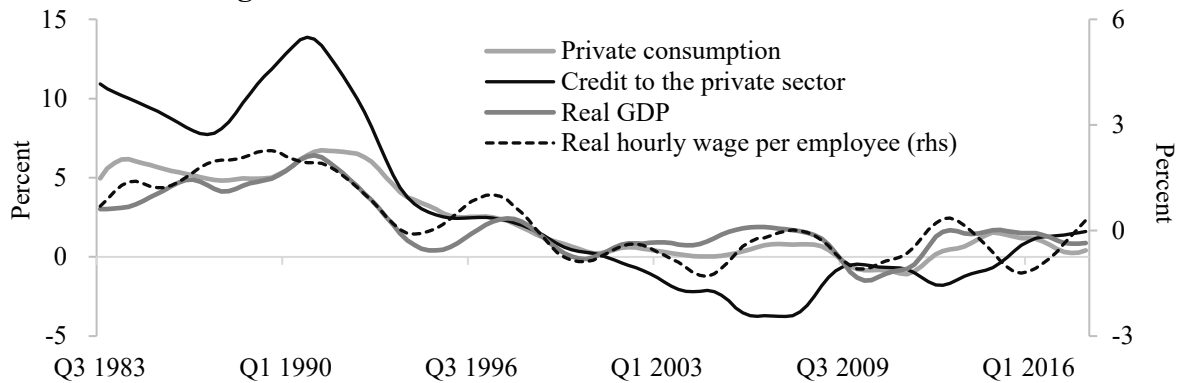


Source: Bank of Japan, IMF IFS and WEO.

The rapid fall of the main policy rate in the 1980s constituted a boost to the real economy, but also became a catalyst for excessive credit growth, overinvestment, and speculation in the Japanese stock and real estate markets (Hoffmann and Schnabl, 2008; Revankar and Yoshino, 2008). In the second half of the 1980s, credit growth skyrocketed, while real wages, real GDP and private consumption grew fast (*Figure 2*). The Nikkei 225 rose from 13,000 points in January 1986 to its historical high of 38,957 on December 29, 1989 (NIKKEI, 2017). Compared to the first quarter of 1985, average land prices (per m<sup>2</sup>) in Tokyo residential areas, commercial districts, and industrial sites had increased by 144%, 154%, and 152%, respectively, in the first quarter of 1991 (JREI, 2017; MLIT, 2017).

<sup>9</sup> See McKinnon and Ohno (1997) for a detailed analysis of the ‘recession caused by appreciation of the Japanese yen’ (日本の円高不況 – nihon no endakafukyo).

**Figure 2: Growth of Japanese private consumption, credit to the private sector, real GDP and real wages**



Source: OECD, MIC, Cabinet Office, Bank for International Settlements.

Note: Real hourly wages are based on total compensation, which includes cash wages and non-wage labor costs, such as social contributions; real wages are CPI-deflated; employees include dependent regular and non-regular employees, but exclude self-employed workers.

The Bank of Japan sought to counteract the overheating of the economy by rapidly increasing the main policy rate from 2.5% in May 1989 to 6% in September 1990. Malinvestments became apparent as interest rates rose, and the bubble economy burst (see Hoffmann and Schnabl, 2008). In January 1991, the Nikkei 225 had lost 40% of its value compared to the previous year; house and land prices followed a similar decline (MLIT Japan, 2017; JREI, 2017; NIKKEI, 2017). Credit, real wage and private consumption growth declined rapidly and fell well below levels of the early 1980s. Real wage levels started to decline since the late 1990s (*Figure 3*).

In response to the lasting economic downturn, the Bank of Japan began an unprecedented series of expansionary measures. Starting in 1992, the BoJ rapidly cut the policy rate, initiating a continuous fall of short- and long-term interest rates until today (*Figure 1*). During the last quarter of 1998, the BoJ paved the way for unconventional monetary policy measures, including zero-interest-rate policy (since February 1999) and quantitative easing (QE, since March 2001).<sup>10</sup> In January 2013, the policy coordination between central bank and government strengthened (Abenomics). The BoJ committed explicitly to a 2% inflation target and introduced quantitative and qualitative easing (QQE), focusing on extensive government bond purchases. This increased the BoJ's balance sheet to 518 trillion JPY in October 2017 and pushed the monetary base from 10% of GDP in 1990 to 80% in 2017 (*Figure 1*). In January

<sup>10</sup> This step followed the 1998-revision of the Bank of Japan Act, which granted formal independence to the Japanese central bank and defined the Bank's policy objectives, including price stability and stability of the financial system. The reform supposedly was a response to criticism regarding the policies preceding and ensuing the Japanese asset bubble.

2016, the BoJ supplemented QQE by a negative interest rate under a three-tier system, and shifted to ‘yield curve control’ in September 2016.<sup>11</sup>

The BoJ’s (un)conventional monetary easing aimed at stimulating the real economy and raising inflation via several transmission channels. By lowering the short-term nominal interest rate to zero, the BoJ intended to reanimate growth and bring inflation to its target (*interest rate channel*). The resulting decrease of the real price of capital should facilitate credit taking (*credit channel*). Firms were expected to increase fixed capital investments (*bank lending channel*), and consumers to increase household borrowing and consumption (*balance sheet channel*). The interest rate cuts should also raise inflation expectations of (non-)banks, and thus push up long-term interest rates in the capital market (*expectations channel*). Rising inflation expectations should affect negotiated wages positively.

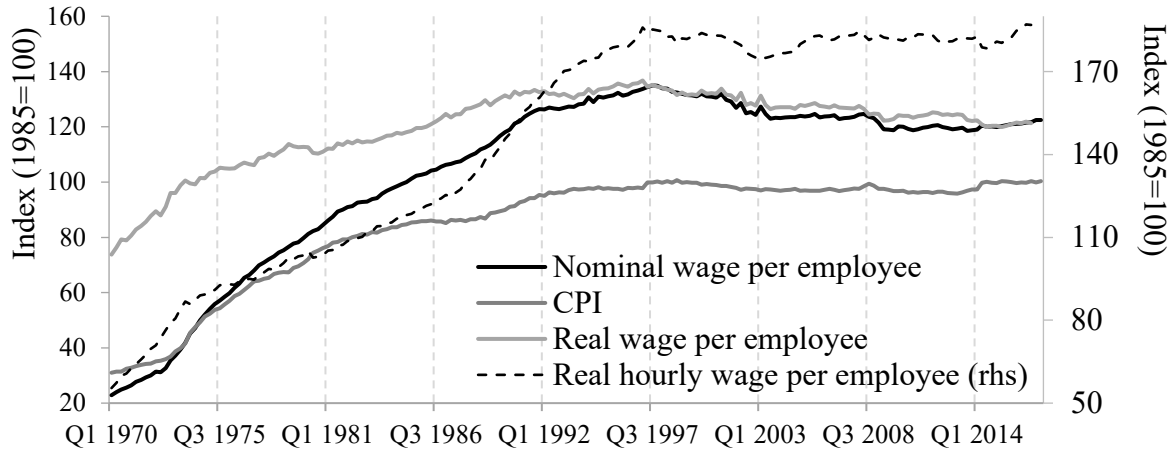
Up to the present, however, the desired effects of monetary policy on the real economy have failed to materialize. Consumer price inflation, real GDP and wage growth, as well as nominal and real wage levels have remained subdued since the second half of the 1990s (*Figure 2* and *Figure 3*).<sup>12</sup> The volume of outstanding credit to the private sector declined since 1998. While gross capital formation as share of GDP decreased from 32% in 1990 to 23% in 2017, government spending as share of GDP increased from 13% in 1990 to 19% in 2017 (CAO, 2017). Thus, expansionary monetary policy has failed to stimulate credit growth and private investments. Instead, stock prices have hiked again since the start of Abenomics and the introduction of QQE in April 2013. The Nikkei 225 has reached levels last observed in the 1990s (NIKKEI, 2017), while real growth has remained subdued.

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<sup>11</sup> Under this system, “the outstanding balance of each financial institutions’ current account at the BoJ is divided into three tiers, to each of which a positive interest rate, a zero interest rate, or a negative interest rate will be applied, respectively” (BoJ, 2016). Yield curve control entails the control of long-term interest rates (additionally to controlling the short-term policy rate) via the purchase of Japanese government bonds (JGBs). See appendix for a detailed chronology of the BoJ’s policy moves.

<sup>12</sup> The introduction of QQE under Prime Minister Abe appears to have had some initial success in lifting inflation. Yet, much of that initial increase reflects temporary factors, such as the sharp yen depreciation in late 2012 or the VAT raise in April 2014.

**Figure 3: Japanese CPI, nominal and real wages**

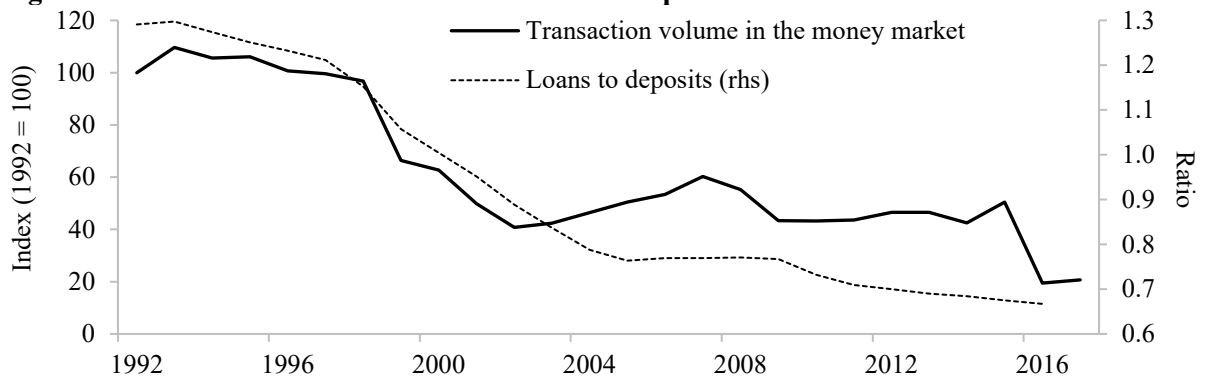


Source: OECD, MHLW.

Note: Nominal and real wages are based on total compensation, which includes cash wages and non-wage labor costs, such as social contributions; real wages are CPI-deflated; employees include regular and non-regular employees.

Generally, there are three explanations for the divide between monetary policy and the Japanese real economy. One is the collapse of financial intermediation. Lending in the interbank market stalled since the outbreak of the Japanese financial crisis in 1998 (Figure 4), as yields on money markets dropped to very low levels in reaction to the decreasing policy rate. Financial institutions with excess cash preferred to deposit their cash at the central bank. Thus, the BoJ was under increasing pressure to provide money market lending to financial institutions with liquidity shortages, a trend symptomatic for the collapse of financial intermediation (McKinnon, 2012; Schnabl, 2014). Bank lending has stagnated or fallen since 1998, with the loans to deposits ratio down at 0.7 in 2016 compared to 1.2 in 1998, a decrease of 42% (Figure 5).

**Figure 4: Indicators of financial intermediation in Japan**



Source: Datastream, Bank of Japan.

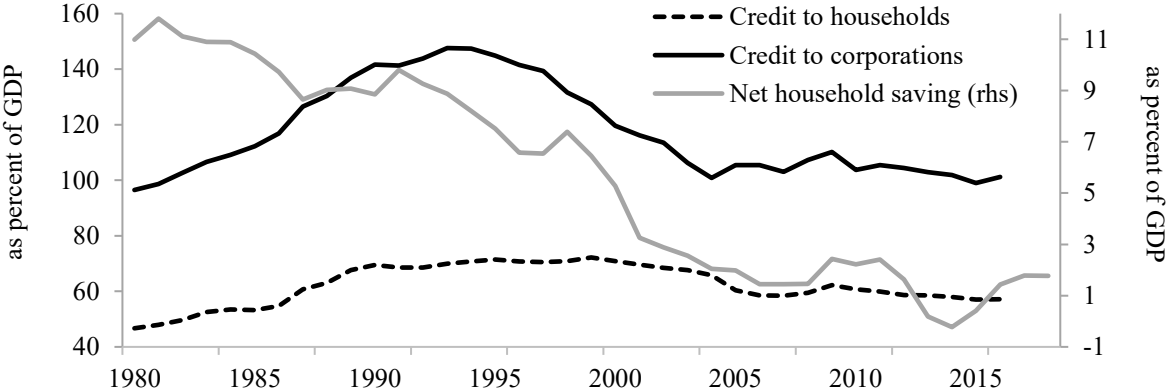
Note: The loans to deposit ratio includes all banks, except shinkin banks. Data including shinkin banks is only available as of 1998. Their inclusion after 1998 does not change the ratio.

A second explanation for the divide between Japanese monetary policy and the real economy refers to the late restructuring of the Japanese financial sector, which had only begun in the early 2000s. Capital remained locked in unproductive firms while productive firms faced impediments to refinancing themselves (Caballero, Hoshi and Kashyap, 2008; Gerstenberger



and Schnabl, 2017). Unproductive firms strived to increase their equity ratios or reduce their number of non-performing loans (NPLs) instead of steering capital towards productive investments. Thus, despite the monetary expansion of the central bank, bank lending decreased for all major banks, including city banks, trust banks, and long-term credit banks (Figure 4). After 2005 but only until 2008, when the Japanese economy recovered slightly, lending activity rose due to changing regulation, although mainly for regional banks. Major banks remained hesitant to lend domestically and increased their international lending instead.

**Figure 5: Private debt levels and net household saving in Japan**



Source: Bank for International Settlements and OECD Economic Outlook.

Koo (2003) provides a third explanation for the divide between monetary expansion and real economic activity by introducing the concept of balance sheet recession. After the Japanese asset bubble had burst, households and firms had to reduce their debt overhang. The resulting falling private demand for credit contributed to the decline in private bank lending, despite very low interest rates. Japanese banks increased their investments in government bonds as a substitute. The deleveraging in the household and corporate sector went along with a decrease in private consumption and investment. As firms deleveraged their balance sheets, they also sought to cut costs by decreasing nominal wages. In turn, this put a restraint on household consumption and net household saving (Figure 3 and Figure 5).

### 3.2 Determinants of real wage repression

Over the past two decades, nominal and real wages in Japan have constantly declined. While consumer price inflation remained subdued, nominal and real wage levels have decreased and real hourly wages have stagnated since 1998 (Figure 3). This wage repression prevents inflation expectations from rising, which would help raise inflation to its current target of 2%.<sup>13</sup> Lise et al. (2013) show that real earnings of households at and below the median income threshold

<sup>13</sup> See Friedman (1968, 1970) for the theory of adaptive expectations and the role of inflation expectations for current inflation.

have already declined after 1996, linking this to a rising trend of inequality in household income and wealth.<sup>14</sup> Private consumption growth has stagnated for the past 15 years, depressing aggregate demand and aggravating the negative effect on growth (*Figure 2*). The negative wage trend may also have exacerbated falling net household savings over time (*Figure 5*).

The rise in real hourly wages per employee in the late 1980s and early 1990s may represent a statistical effect driven by the official reduction of working hours to 40 per week (*Figure 3*).<sup>15</sup> Heinrich (2017) shows that there has been a large discrepancy between these officially recorded working hours and actual working hours. A government survey reveals that more than 22% of the surveyed firms employ workers whose monthly overtime exceeds 80 hours, double the amount recorded in official statistics (MHLW, 2016).<sup>16</sup> In addition, the Labor Standards Law provides loopholes for employers to raise working hours for short periods (unofficially).<sup>17</sup> Thus, accounting for actual working hours, real hourly wages would have increased less steeply between 1987 and 1995 than the data indicates, or may even have declined over time.

Given low inflation, the trend decrease in real wages relates to decreases in the variable and fixed nominal wage components. First, on average, regular employees have experienced a steep trend decline in their variable wage component, their bonus payments (*Figure 6*). Since 1998, bonuses were on average cut by 2.0% p.a. (MHLW, 2017a). These cuts have not been the same across age groups. They have mainly been driven by bonus cuts for labor market entrants (ages 20-24), who have suffered the highest cuts on average during this time, and for young professionals (25-34). On average, the annual bonus cuts of all young workers (15-34) were 0.7 percentage points higher than those for workers of the ages 50-64 (MHLW, 2017a).

Secondly, regular employees have on average experienced a decline in their fixed wage component, their contractual earnings including scheduled and overtime pay (*Figure 6*).<sup>18</sup> Since 1998, contractual earnings have on average decreased by 0.5% p.a., mainly driven by cuts in scheduled pay for employees of the ages 30-49 (MHLW, 2017a). In contrast, young employees that enter the labor market as regular employees have fared better. Their earnings have on average slightly increased by 0.3% p.a. (MHLW, 2017a). This relates to population aging in

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<sup>14</sup> This holds for households whose head is employed, using data of the Family Income and Expenditure Survey (FIES) provided by the Ministry for Internal Affairs and Communication (MIC), ranging from 1981 to 2008.

<sup>15</sup> This reduction relates to a set of amendments of Japan's Labor Standards Law in 1987 and 1992.

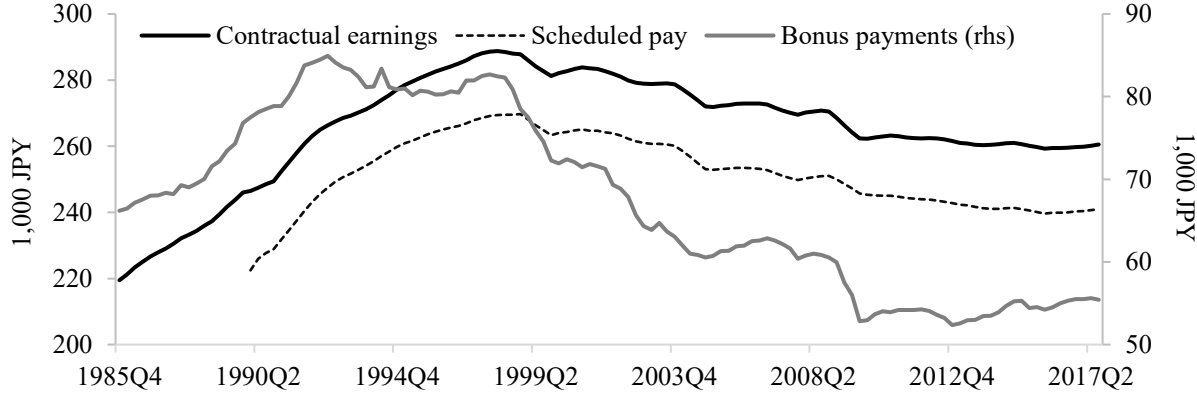
<sup>16</sup> 1,743 (of ~10,000) companies and 19,000 (of ~20,000) workers returned valid responses to the survey. It investigates the risk of death from overwork (*karoushi*), which becomes significant at the 80 hours threshold according to the MHLW.

<sup>17</sup> Article 36 allows work in excess of 40 hours per week if in accordance with the labor union, permitting overtime of up to 45 hours per month or more (for up to six months in case of busy seasons).

<sup>18</sup> The MHLW provides data for total cash earnings, which consist of a contractual- and a non-contractual part. The non-contractual part consists of bonus payments. The contractual part consists of a scheduled component, the so-called base pay, and overtime payments.

Japan and the resulting fast decline of its productive population ratio, i.e. the share of the working-age (ages 15-64) as percent of the total population.<sup>19</sup>

**Figure 6: Nominal average monthly total cash earnings for regular employees**



Source: MHLW.

The decline in the fixed wage component of Japanese regular employees represents a repression of nominal wages over time. Yates (1998), Kimura and Ueda (2001), as well as Kuroda and Yamamoto (2003 and 2007) find that the Keynesian downward nominal wage rigidity for full-time regular employees has disappeared in Japan since the late 1990s.<sup>20</sup> Kuroda and Yamamoto (2007) argue that the economic downturn forced private sector firms to consolidate their balance sheets. Thus, employers and employees agreed on nominal wage cuts in exchange for job security. The downward pressure on average wages has persisted until the present, indicating continuous nominal wage repression.

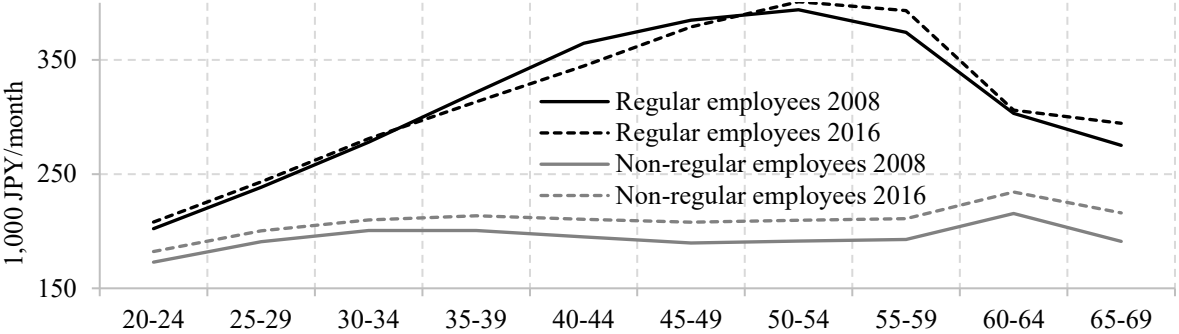
The decline of contractual earnings of regular employees also relates to the substantial gender pay gap in Japan, which has only been slowly closing over time. In 2016, female regular employees received 71% of the contractual pay of their male counterparts, compared to 56% in 1985 (MHLW, 2017a). While contractual earnings for female regular employees have on average increased over time, those of their male counterparts have experienced higher than average wage cuts. Consequently, in 2017, regularly employed households reached their average peak earnings at ages 50-54, in comparison to ages 40-49 in 1988. This has significant future implications for young, regularly employed workers regarding their ability to save.

<sup>19</sup> Japan is experiencing the fastest decline of its productive population among the industrialized economies (OECD, 2017). Moreover, labor immigration into Japan is traditionally low due to institutional and natural barriers, such as strict immigration regulations and language requirements. Although employment of foreign workers has reached a high of one million in 2016 (MHLW, 2017b), it remains relatively low compared to other OECD countries. Foreign born or native born to foreign parents account for only 2% of the population. In the average OECD country, they account for 18% (OECD, 2017). Thus, with the last of the baby-boomers (1947-1949 cohorts) reaching their mandatory retirement age of 65 in 2014, Japan’s working-age population declined from 70% of the total population in 1990 to 60% in 2017, an absolute decline by 9.6 million people (OECD, 2017).

<sup>20</sup> A survey study by Tachibanaki (1991) suggests that Japanese real wages have already been relatively flexible in the 1980s.

The real wage trends for regular employees compiled from data of the MHLW may understate actual negative trends, as they do not include data for non-regular employees (see *Box 1* in appendix). Japan traditionally has a dual labor market, mainly characterized by regular and non-regular employment. In 1984, 85% of the total employees were regular employees, while 15% of the total employees were non-regular employees (MIC, 2017). Regular employees are hired directly by their employers, hold open-ended contracts and work full-time. Non-regular workers (part-time, temporary/“Arbeit”, dispatched workers from temporary labor agencies, or entrusted/contract employees) can be dismissed more easily and allow firms greater wage and employment flexibility. They earn substantially less than regular employees do. In 2016, they earned only two-thirds of the wages of their regular colleagues (*Figure 7*).

**Figure 7: Average monthly nominal wage for two employment types in 2008 and 2016**

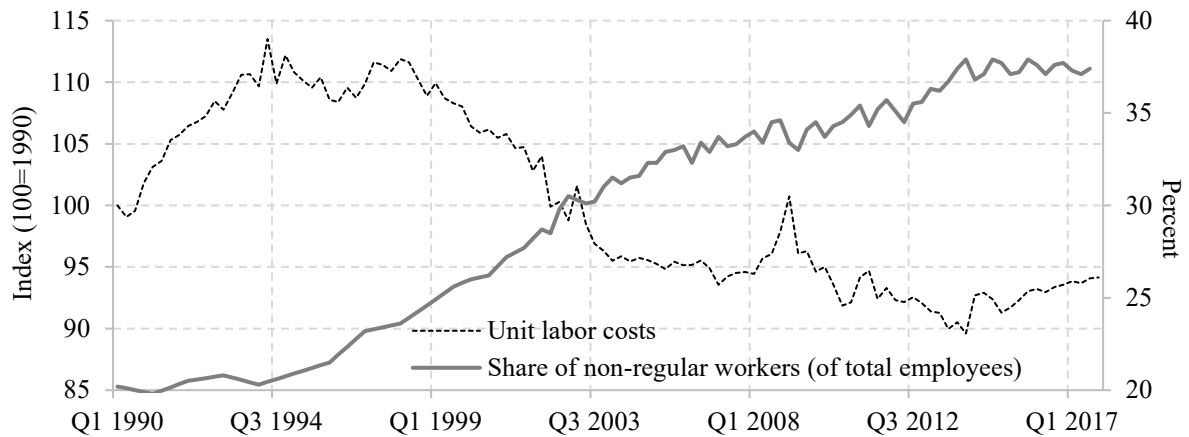


Source: MIC.  
 Note: Data is for scheduled earnings (base pay) of non-regular and regular employees.

Over time, Japan’s labor market duality has increased. In the late 1990s, the Japanese government sought to stimulate the post-bubble economy with a series of labor market reforms targeting rigidities in employment regulations and facilitating the employment of non-regular workers (Song, 2010).<sup>21</sup> Encouraged by these reforms, firms have nearly doubled the share of non-regular workers since 1990 to almost 40% in 2017 (*Figure 8*). The rising employment share of low-wage workers has enabled firms to cut their unit labor costs substantially (*Figure 8*).

<sup>21</sup> In 1997 and 1998, the reforms facilitated the expansion of employment contracts for non-regular workers and the elimination of restrictions on hiring temporary workers from agencies. They also facilitated collective dismissals and the expansion of discretionary working hours. As a result, Japan has one of the largest differentials between the employment protection legislation (EPL) indexes for regular and non-regular employees within the OECD (OECD, 2017). The indexes measure costs involved in hiring and dismissing workers. The latest indicators available for Japan date back to 2013.

**Figure 8: Unit labor costs and share of non-regular employees**



Source: MIC and OECD.

Note: Total number of employees exclude executives of companies or corporations, owners, or self-employed. The legal revisions in 1997 and 1998 concerned the Labor Standards Law and the Worker Dispatching Law, respectively.

Given low inflation, the shift towards ‘non-regular’ employment has depressed aggregate nominal and real wages, despite recent minor wage increases for non-regular workers (*Figure 7*). Compared to 1988, non-regular employment has risen by 168% (12.7 million people) in 2017, whereas regular employment has risen by only 1% (390,000 people) (MIC, 2017). High-wage regular employees, who reached their mandatory retirement age of 65, have mainly been replaced by three types of non-regular employees: working-age females, young workers (ages 15-34, incl. females), and labor market re-entrants (ages 65+). Immigrants, who are traditionally few in Japan, may now enter the labor market into sectors with a high share of non-regular employment, such as services and construction. Kodama et al. (2015) find that half of the decline of the nominal average wage in the total economy is due to the growing employment share of industries dominated by non-regular employment.

Since 1988, the total number of *young* non-regular workers has increased by 142% (1.5 million people), so that 25% of non-regular employees were young workers in 2017. 47% of those aged 15-24 and 25% of those aged 25-34 were non-regular workers in 2017 (compared to 17% and 10%, respectively, in 1988). 44% of non-regular employees were on average between 15 and 44 years old. In contrast, the number of young regular employees has decreased by 25% (3.4 million; a decrease of 48% for the ages 15-24, equivalent to 2.4 million people), suggesting that young workers have increasingly entered the labor market via low-wage non-regular employment.<sup>22</sup>

<sup>22</sup> In 2017, 42% of all employees were working-age females, and 53% of them were non-regular employees (compared to only 22% of their male counterparts). Since 1988, this number has increased by 132% (7 million people) so that 61% of all low-wage non-regular workers were working-age females in 2017. Only 8% of all employees are elderly workers (65+), yet 74% of them were non-regular employees in 2017. Since 1988, their number has increased by 800% (2.8 million people) so that 15% of all non-regular workers in 2017 were of the ages 65+.

#### 4. The transmission mechanism between monetary policy and real wages

The literature on the negative real wage trend in Japan omits the potential impact of monetary policy. This appears to be in line with the New Keynesian model, which analyzes real effects of monetary policy exclusively in the context of nominal rigidities. However, research suggests, that downward nominal wage rigidity in Japan has disappeared (see 3.2), and that price flexibility has increased since the 1990s, particularly compared to the U.S. or the euro area (Higo and Saita, 2007; Sudo et al., 2013; Abe and Tonogi, 2010).<sup>23</sup> Thus, the literature argues that Japan is closer to the neoclassical than the Keynesian world (Hashimoto, 1979; Suzuki, 1985; Kahn, 1984; Yates, 1998; Abe and Tonogi, 2010). Accordingly, in order to explain the impact of monetary policy on real wages it is necessary to account for the neoclassical relationship between real wages and labor productivity. This allows reassessing the determinants of Japanese real wage trends and evaluating them in international comparison.

##### 4.1 The transmission of monetary policy to real wages

The Barro-Gordon model implies that an unexpected monetary expansion leads to an inflation bias that outstrips nominal wage increases, with a negative effect on real wages in the short-run (see 2.1). Austrian theory suggests that excessive monetary easing induces an economic upturn ensued by a downturn, during which prices decline faster than nominal wages so that real wages decline (see 2.2). However, both approaches do not explain declining real wages over the long run, accompanied by a stagnant CPI and persistent monetary easing.

The long-run transmission of monetary policy shocks to real wages can occur via the neoclassical link between real wages and labor productivity and the effect of monetary policy on labor productivity (see 2.1). According to the Cobb-Douglas relationship, it holds that

$$MPL = (1 - \alpha)AK^\alpha L^{-\alpha} = (1 - \alpha)Y/L, \quad (5)$$

so that shocks to labor productivity can theoretically originate in changes in capital ( $K$ ), employment ( $L$ ), or total factor productivity ( $A$ ). Hence, monetary shocks can affect labor productivity via these input factors.

First, monetary policy can affect labor productivity via shocks to total factor productivity (TFP) that are related to the *allocation function* of the central bank's interest rate (policy rate). In a frictionless world, the allocation of capital depends on the expected yield of invested capital.

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<sup>23</sup> Earlier studies find price rigidity (BoJ, 2000) or relative downward rigidity in some items of the CPI (Kasuya, 1999).

Given the policy rate, banks allocate loanable funds efficiently to investments with expected rates of return that match (or are higher than) the interest rate in the credit market. Financial liberalization, characterized by the elimination of government intervention in the financial sector, ensures this allocative efficiency (McKinnon, 1973; Shaw, 1973).<sup>24</sup> It also encourages household savings, as these savings are responsive to changes in the policy rate (Galindo et al., 2007).<sup>25</sup> Resources are put to their most productive use so that labor productivity rises via increases in  $A$ , and pushes up real wages.

Persistent monetary easing suspends this allocation function, with a negative shock to  $TFP$ . Labor productivity decreases so that real wages fall. According to Schnabl (2017), a declining cost of capital during an economic upswing encourages the allocation of loanable funds to investment projects with low expected rates of return. During an economic downturn, continuously low capital costs preclude a “cleansing effect”, since all investments can survive irrespective of their productivity (Schumpeter (1983 [1912]); Brunnermeier, 2014). Capital is not reallocated efficiently, but remains locked in unproductive corporates (Caballero, Hoshi and Kashyap, 2008; Gerstenberger and Schnabl, 2017).  $TFP$  falls.

The number of productive, high-return investments also decreases if the government allocates capital according to political preferences (McKinnon, 1973; Shaw, 1973). Under such a repressed financial system, unproductive firms are kept alive to avert rising unemployment (Kornai, 1986; Hoffmann and Schnabl, 2016a). Given increasingly expansionary monetary policy, a vicious cycle of negative labor productivity shocks and real wage cuts can evolve.

Secondly, a negative effect of monetary expansion on labor productivity occurs via shocks to the capital stock that relate to the *signaling function* of the policy rate. The policy rate is the central bank’s monetary policy reaction to indicators of economic conditions, such as inflation or output. According to this signal, intermediary banks set their interest rates, and allocate their loanable funds while adding a mark-up for the individual risk of credit-takers. This mark-up on the policy rate signals default risk.

Persistent monetary easing counteracts this signaling function, with a negative effect on the capital stock. Agents undertake risky investment projects despite high default risk. The number of investment projects with low or negative return increases. Accordingly, corporates tend to

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<sup>24</sup> While Shaw (1973) and McKinnon (1973) originally analyzed the effects of financial liberalization in developing economies, their conclusions also apply to advanced economies. Gemech and Struthers (2003) and Reinhart and Tokatlidis (2005) show that the institutional factors identified with financial liberalization, such as a limited amount of market failures and government intervention in the financial system, are equally crucial for an efficient allocation of capital in the case of advanced economies.

<sup>25</sup> See also Giovannini, 1985; Ostry and Reinhart, 1992; Bayoumi, 1993; Obstfeld, 1998; Stulz, 1999; Mishkin, 2001.

scale back their real investments since returns on real investments fall relative to risky investments in the financial markets (Hoffmann and Schnabl, 2016a). For example, unconventional monetary easing encourages growth in the high-risk derivatives market (see Thornton, 2010; Mendoza and Vincenzo, 2010; Castelnuovo, 2012; Coibion, 2012). This represents a negative impact on the quality and size of the corporate capital stock under persistent monetary expansions. Thus, a cycle of negative labor productivity shocks and real wage declines may evolve.

Recent empirical research confirms an impact of monetary policy on labor productivity via the allocation and signaling function of the policy rate. The literature shows that monetary expansion can contribute to financial market bubbles, which lead to an inefficient allocation of capital (Adrian and Shin, 2008; Brunnermeier, 2014; Hoffmann und Schnabl, 2008, 2011, 2016b; Dell’Ariccia and Marquez, 2006; Gourinchas, Valdés, and Landerretche, 2001; Schularick and Taylor, 2009; Forbes, 2015). Borio et al. (2015) reveal that such monetary-policy-induced bubbles, particularly credit booms, are characterized by a reallocation of labor towards economic sectors with low or negative labor productivity growth, undermining aggregate labor productivity growth.<sup>26</sup>

Hoffmann and Schnabl (2016a) as well as Borio and Gambacorta (2017) show that monetary easing affects labor productivity growth negatively via its impact on risk perception in the intermediary banking sector. Given the low cost of capital, banks lose their strict budget constraint, which allows insolvent banks to conceal their bad lending portfolios and remain in the market. This prolongs risky investments with low or negative expected returns, saving unprofitable firms from market exit. Thus, the so-called zombie lending increases with expansionary monetary interventions (Calderon and Schaeck, 2016).

There are three potential caveats regarding the link between real wage growth and labor productivity. First, an incomplete measurement of nominal wages may distort the relationship between real wages and labor productivity. A real wage measure that only takes into account nominal cash wages understates the total compensation of workers (see *Figure 9*). Instead, the measure should include nominal cash wages and non-wage labor costs, such as employers’ pension contributions and healthcare benefits. These non-wage labor costs are an increasingly significant part of total compensation. In Japan, social benefits accounted for 15 % of workers’ total compensation in 2017, compared to 7% in 1980 (OECD, 2017). As the employers’ (and

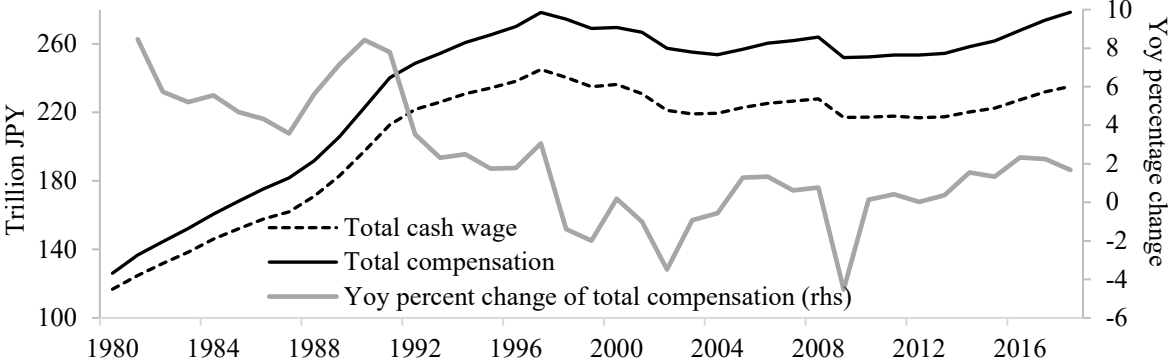
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<sup>26</sup> Van Zandweghe (2015) ignores credit cycles, and thus only finds temporary effects of monetary policy on labor productivity.



employees’) contribution to total compensation as well as cash wages have decreased over time, total compensation growth has stalled and declined significantly since 1990, and increased since 2012 (see *Figure 9*).

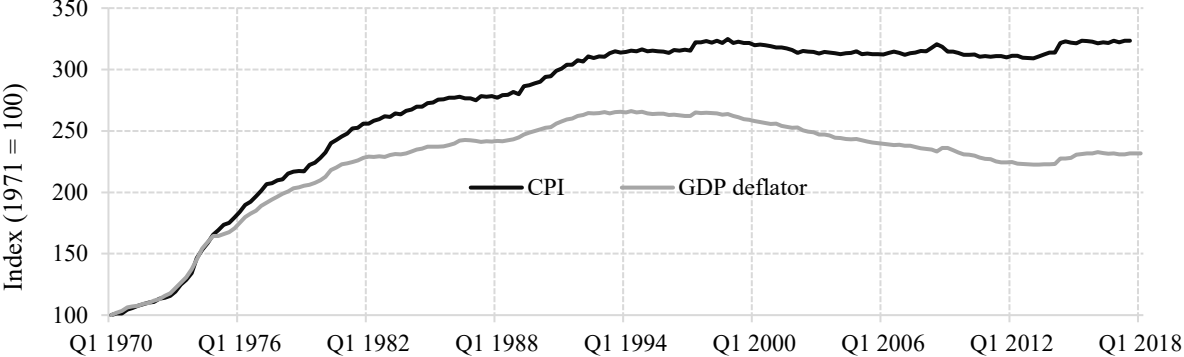
**Figure 9: Total nominal compensation and cash wages in Japan**



Source: OECD.  
 Note: Total compensation and total cash wages do not account for changes in employment or working hours.

Secondly, the measurement of prices may bias real wages, real output and labor productivity. In Japan, the GDP deflator and CPI include downward adjustments of prices according to the hedonic approach, whereby prices should decline if the quality of a good or service has risen. This shift to hedonic price measurement has biased the price level downward. Since 1975, the GDP deflator has declined faster than the CPI deflator. On the one hand, this is due to a diverging basket of goods used for the computation of both price measures. The GDP deflator includes IT-related investment goods whose prices have fallen faster over time compared to others goods (Koga, 2003). On the other hand, the gap is due to diverging index formulae used for the computation of the two price measures, with the Laspeyres index used for the CPI and the Paasche index used for the GDP deflator (Koga, 2003).

**Figure 10: CPI and GDP deflator for Japan**



Source: MIC and OECD, 2018.

Lastly, distribution effects may disrupt the link between real wages and labor productivity. Growing domestic nominal wage inequality causes the average wage to rise faster than the

median wage.<sup>27</sup> Thus, if data capture average real wages instead of median wages, real wages appear to increase, although labor productivity may fall. Moreover, a falling labor share, the share of employee's (and self-employed persons') compensation in GDP, may also disrupt the link between real wages and labor productivity. Jaumotte and Tytell (2007) as well as Sommer (2009) show that the labor share has declined in most advanced economies since the late 1990s, including Japan.<sup>28</sup> Given a falling labor share  $(1 - \alpha)$ , the marginal product of labor (*MPL*), which theoretically determines labor productivity, falls in the standard Cobb-Douglas function:

$$\frac{w}{p} = MPL = (1 - \alpha)AK^\alpha L^{-\alpha} = (1 - \alpha)\frac{Y}{L} = (1 - \alpha)APL. \quad (6)$$

Yet, data often capture average labor productivity (*APL*) instead of the *MPL*. Thus, a falling labor share would disrupt the relationship between real wages and *average* labor productivity.

## 4.2 Real wage repression in international comparison

*Figure 11* shows year-on-year growth trends of real wages, labor productivity, and short-run interest rates for Japan, Germany, the UK, and the US. Accounting for the data caveats outlined in 4.1, real wages are based on total nominal compensation per employee and per hour worked, excluding self-employed workers. As is standard in the literature, the CPI is used as a deflator for the calculation of real compensation. While this deflator may bias real wages upward due to its hedonic computation approach, it is the standard deflator to capture price inflation perceived by households. For reasons of limited data availability, the average nominal wage is used instead of the median wage, accepting a potential upward bias of real wages.

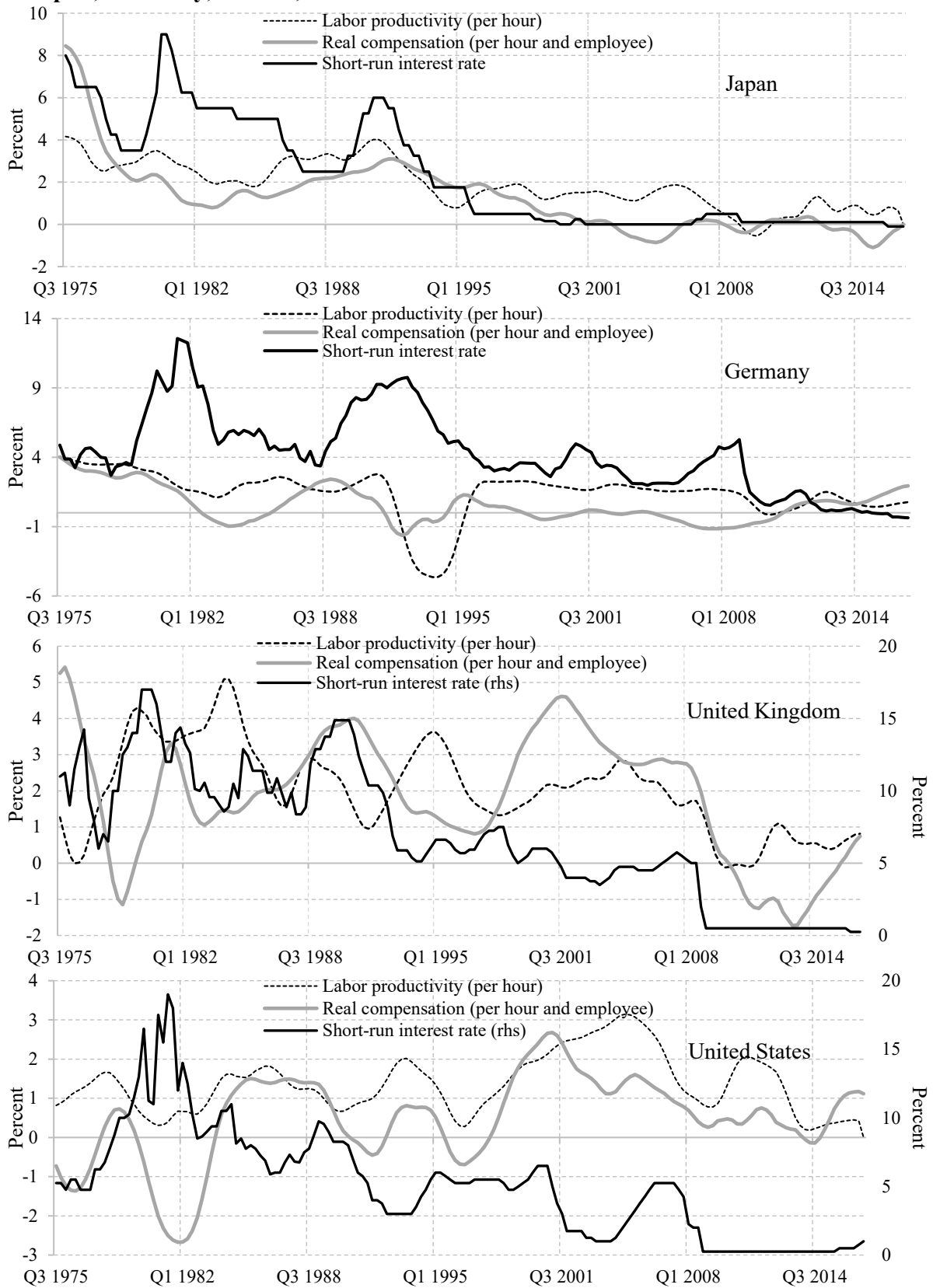
The measure of labor productivity is based on real GDP per hour and per employee, deflated by the GDP deflator. The GDP deflator may also be biased downward due to the hedonic approach used for its computation. Yet, it is also the standard deflator to capture price inflation perceived by producers. Thus, labor productivity is a measure of hourly labor productivity of the total economy.

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<sup>27</sup> The median wage is the “wage in the middle”. The wage distribution is divided in two equal groups, whereby one group of workers earns a wage above the middle, and the other one below. The average wage is obtained by dividing the total aggregate wage by all workers. Thus, the median wage can be less than the average wage if wage inequality is high.

<sup>28</sup> Sommer (2009) suggests that globalization and technological change have caused Japan's labor income share to fall as they facilitated the relocation of production and off-shoring to low-cost areas outside of Japan. This has made Japanese firms more sensitive to cross-country wage differentials so that nominal and real wage growth in Japan stalled (see also Rodrik, 1997; OECD, 2007). However, the theoretical and empirical impact of globalization and technological progress on wage growth in advanced economies remains ambiguous. Feenstra (2007), for example, shows that free trade can have a positive impact on productivity and real wages. Chen et al. (2017) show that a declining cost of capital in the low interest rate environment and the increase in firm markups has led to a decline in the labor share.

**Figure 11: Short-term interest rates, real wage growth and labor productivity growth in Japan, Germany, the UK, and the US**



Source: OECD.

Note: Real hourly wages are based on total compensation, which includes cash wages and non-wage labor costs, such as social contributions; real wages are CPI-deflated; employees include dependent regular and non-regular employees, but exclude self-employed workers; total labor productivity is based on real GDP per hour and per dependent employee, deflated by the GDP deflator.

In all four economies, declining labor productivity growth and real wage growth accompany the policy rate cuts by the respective central banks (*Figure 11*). In Japan, this negative trend has become notable since 1993, when the BoJ introduced a policy rate below 2%. Once the policy rate reached the zero-lower bound in the early 2000s, real wage growth has been stagnating around zero, along with labor productivity growth. Similarly, in Germany, the negative trend growth of labor productivity has accompanied the falling policy rate. Real wage growth has declined significantly since 1995, once the first of two structural breaks of the policy rate has become visible in the early 1990s. Ever since, it has stagnated around zero, along with labor productivity growth.

In the UK and the US, the negative trend of labor productivity and real wages has become visible more recently, with the fall of the respective policy rates to the zero-lower bound and the start of unconventional monetary easing following the global financial crisis (*Figure 11*). Since 2009, when the Bank of England and the Federal Reserve cut their policy rates to the historically lowest levels of 0.5% and 0.25%, respectively, real wage growth and labor productivity growth have remained subdued.

There is a noticeable gap between labor productivity and real wage growth in all four countries. This gap may relate to the structural duality of the economies, which entails increasing wage inequality across economic sectors. Over time, they have evolved from manufacturing to service economies as the share of value added services in GDP has increased substantially.<sup>29</sup> Yet, nominal wages in financial services have increased disproportionately more than in manufacturing, causing a growing wage inequality across economic sectors. Thus, the wage trends in services weigh on aggregate wage trends and may distort the relationship to aggregate labor productivity growth of the total economy.

The increases in aggregate labor productivity growth and real wage growth in the UK and US in the late 1990s, which continued into the mid-2000s, may relate to the size of the financial sectors. Owing to credit booms and overinvestment in the financial sector, leading up to the financial bubbles in the early 2000s and 2007/8, labor productivity and real wages in this sector increased, raising their aggregate levels in the two countries. This is similar to the Japanese

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<sup>29</sup> The US and UK manufacturing sectors have shrunk from 16.6% and 17.7% of GDP (value added) in 1997 to 11.2% and 8.3% of GDP in 2016, respectively. In contrast, the services sectors including financial services have grown from 74.7% and 71.9% of GDP in 1997 to 78.8% and 80.8% of GDP in 2016, respectively (WDI, 2017). Similarly, the Japanese manufacturing sector has also shrunk over time, albeit in a less pronounced manner (from 21.4% of GDP in 1997 to 17.2% of GDP in 2016), and the services sector has grown (from 66.7% to 75.4% of GDP) during the same time span. While the German manufacturing sector has retained its share in GDP over time (with 22.4% in 1997 compared to 22.5% in 2016), its services sector has grown slightly from 67.4% in 1997 to 69.3% in 2016.

bubble economy, which was driven by a credit boom and overinvestment in financial services. Yet, since the outbreak of the global financial crisis, the UK and the US have experienced a decline of labor productivity and real wage growth, which have come along with policy rate cuts.

Empirical evidence for Japan confirms this negative impact of expansionary monetary policy on labor productivity and real wages. Peek and Rosengren (2005) show that expansionary monetary shocks have led to inefficient capital allocation in the credit market, which benefited investments with low return. Zombie firms that depend on low-cost capital have emerged and survived in the Japanese corporate sector, with a negative effect on labor productivity growth (Caballero, Hoshi and Kashyap, 2008). Ahearne and Shinada (2005) demonstrate that labor productivity growth is low in industries with a heavy concentration of zombie firms, and correlates with the market share of zombie firms in one industry.

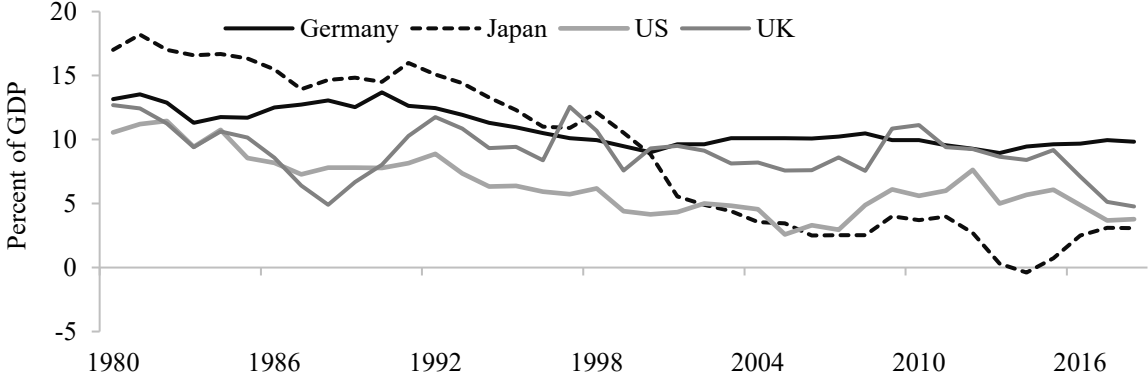
Similarly, the literature confirms these effects of persistent monetary expansions for other advanced economies. Barnett et al. (2014a) show that aggregate productivity growth in the UK has declined due to lower investment in physical and intangible capital, an increasingly inefficient allocation of capital and labor, and the (post-crisis) survival of less productive firms. A recent surge of empirical research focuses on the UK's "labor productivity puzzle" since the financial crisis (see Broadbent, 2012, 2013; Arrowsmith et al., 2013; Barnett et al., 2014b). Calligaris et al. (2016) find that low-productivity firms in Southern European non-manufacturing industries have been able to survive after the 2008-crisis. Gopinath et al. (2015) associate declining labor productivity growth with dramatically falling interest rates in Italy and Spain. Lastly, Decker et al. (2013) provide evidence for the US, and find that the contribution of Schumpeterian "cleansing" to productivity growth is declining over time.

In contrast, the concept of 'secular stagnation' suggests that the decline of labor productivity growth in industrialized economies relates to long-run structural changes, particularly demographic change and the slowing of technological progress (Hansen, 1939; Bernanke, 2005; Summers, 2014; von Weizsäcker, 2014; Laubach and Williams, 2015). Owing to these factors, the household and corporate propensity to save increases (savings glut), while the propensity of enterprises to invest decreases (Bernanke, 2005). According to Modigliani's (1966) life-cycle model, households in an aging society are more prone to save (for retirement) than to consume during their working-age stage of life. Household savings rise, dragging down aggregate demand and corporate investments. Hansen (1939) argues for the 1930s that corporate investments declined as technological progress reached a limit and slowed down,

thereby reducing productive investment opportunities and encouraging corporate savings (see also Gordon, 2012). Given this household and corporate savings glut, the capital stock declines with decreasing investment weakening labor productivity.

However, the proposed savings glut is not visible for households in industrialized economies as their net household savings (as percent of GDP) have declined over time (*Figure 11*). In the UK, the US, and Germany, they have trended continuously downwards since the 1980s. In the UK and the US, net household savings reached historical lows of 4.7% of GDP and 3.7% of GDP at the beginning of 2018, compared to 12.7% of GDP and 10.6% of GDP in 1980, respectively. In Germany, they reached a historical low of 9.8% of GDP at the beginning of 2018, compared to 13.1% of GDP in 1980. These declines have occurred despite aging populations in all three economies, whose working-age workers would theoretically need to save more for retirement.

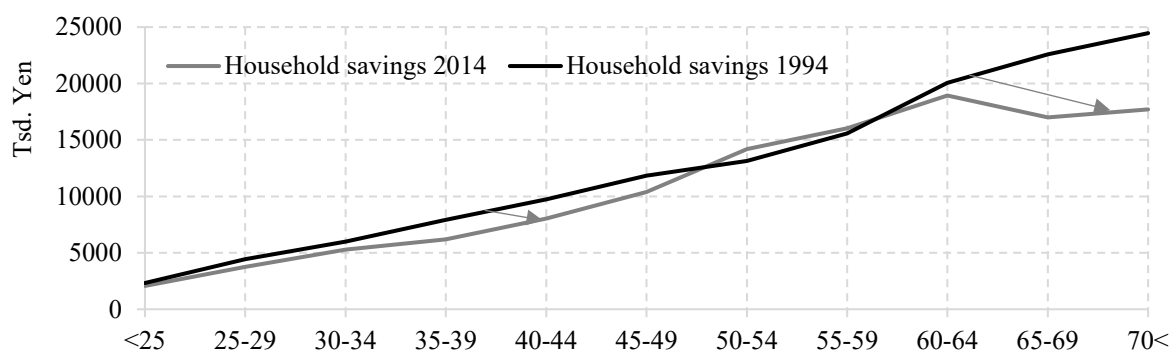
**Figure 12: Net household savings as percent of GDP in international comparison**



Source: OECD Economic Outlook.

The trend decline in Japanese net household savings (percent of GDP) has been most pronounced (*Figure 12*). They fell from 17% of GDP in 1980 to only 3% of GDP in 2018, and even turned negative for the first time in 2013. The Japanese aggregate net household savings rate may have been dragged down by the increasing number of elderly, retired households, who are more prone to consume according to the life-cycle theory of consumption and saving. Yet, traditionally, Japanese household savings over the life cycle have not been hump-shaped as the theory predicts. Instead, savings have traditionally been high among elderly households (*Figure 12*). Contrary to the life-cycle hypothesis, households of the ages 30-50 have decreased their savings, too (*Figure 12*). Moreover, there is a dramatic decrease in savings of elderly households (60+). These trends indicate a change in household savings behavior in Japan not related to the life-cycle hypothesis.

**Figure 13: Japanese household savings per age group**

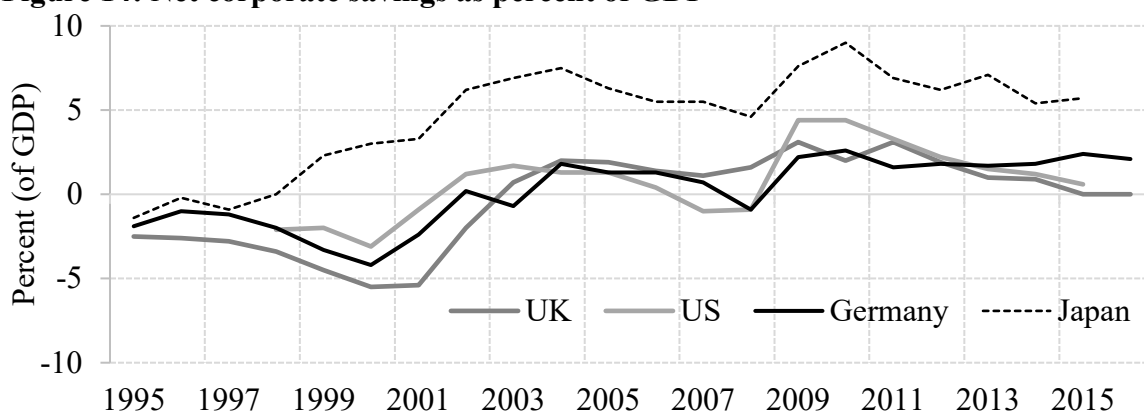


Source: MHLW.

Note: Data are available every five years, starting in 1994; latest data are for 2014.

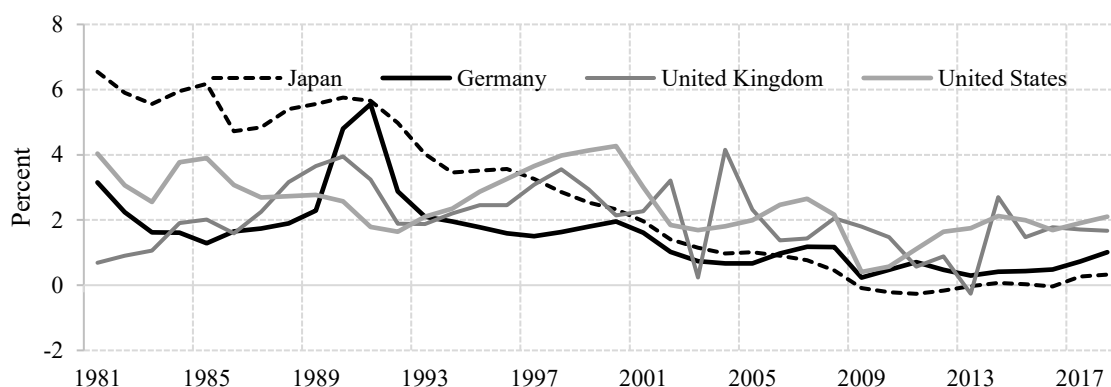
The missing household savings glut has been replaced by an increasing savings glut in the corporate sector of advanced economies, which corresponds to increasingly low corporate investment activity amid loose monetary policy (*Figure 14*). A comparison between the years 1980 and 2017 shows that investments declined from 33.8% to 23.5% of GDP in Japan, from 30.0% to 19.4% in Germany, from 19.1% to 17.0% in the UK, and from 23.3% to 19.7% in the US (IMF, 2017). In contrast, net corporate savings rose rapidly from 1995, when data is first available, to 2015. They increased from -1.4% to 5.7% of GDP in Japan, from -1.9% to 1.4% of GDP in Germany, from -2.5% to 0% of GDP in the UK, and from -2.1% (in 1998) to 0.6% of GDP in the US.

**Figure 14: Net corporate savings as percent of GDP**



Source: OECD.

**Figure 15: Corporate capital stock growth in Japan, Germany, the UK and the US**



Source: Oxford Economics, 2018.

The corporate savings glut and declining corporate investments aggravate the negative effect on labor productivity growth as the corporate capital stock stagnates or even declines. In Japan, yoy capital stock growth declined from 7% in 1981 to 0% in 2017. Similar trends can be observed for Germany, the UK and the US (see *Figure 15*). The concept of ‘secular stagnation’ explains this phenomenon by arguing that high-return investment projects are depleted. This ignores that the pronounced fall in short-term interest rates and the introduction of unconventional expansionary monetary policy constituted a large subsidy for falling costs of enterprises, providing them with an incentive to speculate in the financial market rather than to engage in investments in their capital stock.

## 5. Conclusion

Based on the prolonged Japanese experience with monetary expansions, this paper examines potential real wage effects of monetary easing. Amid the Bank of Japan’s prolonged expansionary monetary stance, labor productivity growth and real wage growth have declined over time. Consistent with New Keynesian theory, the existing empirical literature mainly accredits structural factors with these trends, ignoring the potential long-run effects of monetary policy on real wages.

This paper offers an augmented theoretical framework based on the neoclassical link between labor productivity and real wages to explain such effects. Prolonged monetary expansions can suspend the allocation and signaling function of the policy rate, and hence depress total factor productivity and the corporate capital stock. This has a negative impact on labor productivity, which translates into negative real wage shocks. Empirical evidence confirms this transmission mechanism for Japan, and indicates similar trends in Germany, the UK, and the US.



Central banks and governments of industrialized economies currently regard expansionary monetary policy as remedy for financial crises and their ensuing economic slack. Yet, the potential real wage effects of this policy may curtail the effectiveness of monetary policy and have serious welfare implications. As real wages fall, household consumption decreases, which reduces aggregate demand. Corporates adjust their investment behavior by cutting their real investments. The growth of the capital stock slows down, perpetuating the negative cycle of labor productivity shocks and real wages, with a negative effect on economic growth and inflation. Moreover, while low interest rates discourage household savings due to low returns on savings, declining real wages further limit the ability of households to save. This problem is particularly pressing for young households, with stark implications for the inter-generational distribution of income and wealth.

Given real wage effects of expansionary monetary policy, future empirical research will have to reconsider the optimal design of monetary policy. It will have to analyze potential redistribution effects of expansionary monetary policy, particularly as declining real wages may affect the income distribution and the ability of households to save.

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## Appendix: Japanese wage data and its sources

The OECD and Cabinet Office (CAO) only provide aggregate wage measures, showing compensation per employee and compensation per hour. Measures on hours worked are limited to hours worked by an “average” employee (OECD) and overtime (non-scheduled) hours worked (CAO). Moreover, both data sources do not distinguish between employment types (i.e. non-regular and regular employment).

The Ministry of Health, Labour and Welfare (MHLW) and the Ministry of Internal Affairs and Communication (MIC) provide more detailed measures on earnings. While the MIC provides detailed data such as wages of various employment types, age groups and the two genders, the MHLW provides a break-down of wages into scheduled and non-scheduled components (for regular employees). Yet, a sufficiently long and consistent time series is only available for earnings and earnings components of regular employees and part-time regular employees as provided by the MHLW.

Importantly, MHLW and MIC use different definitions of employment types so that their respective numbers of regular employees do not correspond to each other. However, the MIC’s definition, which includes part-time workers, temporary workers (“Arbeit”), dispatched workers (from temporary labor agencies), entrusted employees, and contract employees, is a relatively accurate description of non-regular employment in Japan. It is thus sensible to use this data set (starting in 1984, including breaks, quarterly data since 2002) for analysis.

Accordingly, as part-time workers would fall under non-regular employment, it is common to use the MHLW’s data on wages of full-time and part-time regular employees as proxy for depicting wage differentials between regular and non-regular employees. Regardless, it is doubtful that this proxy would be sufficiently accurate as the discrepancy between the measures provided by the proxy and the MIC is very high (according to the proxy, there are about 80% regular employees, while according to the MIC there are only about 60% of them).

The MHLW also provides extensive data on hours worked, including data divided by the size of firms (according to the number of employees), industry type as well as type of hours worked (i.e. scheduled or overtime). However, these data only apply to regular employees.

The MHLW also provides the results of the annual negotiated wage increases (*shunto*). The so-called *shunto* wages are negotiated for regular workers in large firms and serve as benchmark for non-regular workers and SMEs. Yet, *shunto* scheduled wages overstate aggregate trends since they include overall and annual seniority increases. Provided the demographic structure of a firm is unchanged, payment for seniority does not change aggregate compensation. Additionally, *shunto* increases only change aggregate compensation per regular employee. Thus, the aggregate effect for all workers will be more marginal the larger the share of non-regular employment.

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