

OVERCOMING THE LOST DECADES? ABENOMICS AFTER THREE YEARS

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Abstract

We review the recent performance of the Japanese economy under Abenomics. Abenomics, and expansionary monetary policy in particular, continued to weaken the yen and raise stock prices in 2014. It also continued to generate positive inflation, though neither actual nor expected inflation are yet 2%. Real effects of Abenomics have been modest. Performance would have been better if not for two puzzles: The response of net exports to the weak yen was small, and there is little evidence that expansionary monetary policy had large effects on consumption.

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1 Introduction

Shinzo Abe took office as prime minister of Japan in December 2012 and embarked on a set of economic policies dubbed Abenomics. Abe’s economic program consisted of three arrows: (1) expansionary monetary policy, (2) expansionary fiscal policy, and (3) structural reforms. Under governor Haruhiko Kuroda’s leadership, the Bank of Japan has vigorously pursued expansionary policy. But fiscal policy, while initially expansionary, turned contractionary with the increase in the consumption tax from 5% to 8% in April 2014. And while progress has been made on some structural reforms (e.g. electricity deregulation, corporate governance, and female labor force participation), many of Abe’s reform promises remain unimplemented ([International Monetary Fund, 2015](#)). Thus we focus on monetary policy, the arrow of Abenomics that is the most novel and the most fully implemented.

In April 2013, the Bank of Japan embarked on a program of “quantitative and qualitative easing” with the goal of achieving 2% inflation in two years ([Bank of Japan, 2013a](#)). To achieve this goal, between the fourth quarter of 2012 and the first quarter of 2015, the Bank of Japan increased the monetary base from 25% of GDP to 57% of GDP. It accumulated 128 trillion yen of Japanese government debt (JGBs), equal to more than 25% of GDP.

In the next section, we review the effects of Abenomics, and these monetary actions in particular, on intermediate indicators. Building on the analysis in our previous paper ([Hausman and Wieland, 2014](#)),¹ we show that expansionary monetary policy continued to weaken the yen and raise stock prices in 2014. Yet effects on non-financial variables were muted. Inflation expectations from market participants and professionals forecasters remain roughly one half to one percentage point below the Bank of Japan’s 2% target. Actual headline and core inflation are also still well below 2%. We argue that persistent low expected inflation largely reflects imperfect credibility of the 2% inflation target, although we cannot rule out some role for adaptive expectation formation and backward looking price-setting behavior.

In section 3, we consider the response of output to Abenomics. Between the fourth quarter

¹For other recent evaluations of Abenomics and quantitative easing in Japan, see [Patrick \(2014\)](#) and [Ito \(2014\)](#).

of 2012 and the second quarter of 2015, annualized GDP growth was 0.9%;² per person age 15-64 (the working age population), it was 2.4%. A comparison to the rest of the world in this time period suggests success. For example, between the end of 2012 and the second quarter of 2015, annualized GDP growth per working age person was 1.8% in the U.S. and 1.1% in Germany. But relative to professional forecasts, Japan's performance has been disappointing. Output in 2015 is likely to be at least a percent lower than that forecast in October 2012, before Abenomics began.³

Performance would have been better if not for two puzzles: weak consumption and weak net exports. Despite a one percentage point decline in the real interest rate, consumption has been flat during Abenomics. To better understand this, we use the Japanese Family Income and Expenditure Survey to investigate how expansionary monetary policy is affecting different types of households. Results are puzzling in that there are no visible effects of monetary policy on the consumption of households expected to benefit most, net debtors and the young. In contrast, the April 2014 consumption tax increase had large effects on the consumption of all types of households. Thus the story of flat consumption in Japan may be one in which expansionary monetary policy had relatively little positive effect while contractionary fiscal policy had large negative effects. A further mysterious factor behind slow output growth is a large increase in real imports. Since Abenomics began, real imports have risen over 10% despite flat consumption and a weakening yen. We discuss three popular hypotheses — a decline in the relative price of imports, an increase in energy import demand, and an increase in foreign electronics demand —, but find all of them to be either unsupported by the data or too small to explain the size of the import increase. Thus, in our view, the increase in imports remains a puzzle.

Section 4 turns to the outlook for future output and consumption in Japan. Consensus forecasts are for the level of GDP over the next five years to be nearly the same as that forecast in October 2012, before Abenomics began. This is in large part because the path of Japanese

²All data are as of 8/28/15. See the data appendix for information on sources.

³This assumes that actual 2015 output growth is equal to 1%, the Consensus Economics forecast made in April 2015.

consumption is now forecast to be below that expected in October 2012. This is consistent with a larger than expected negative effect of the consumption tax and the lack of progress on structural reforms.

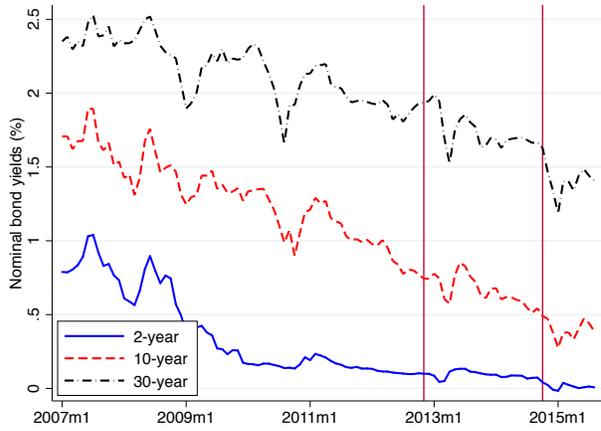
We concluded in [Hausman and Wieland \(2014\)](#) that the first arrow of Abenomics, expansionary monetary policy, most likely passed a cost-benefit test. This remains our conclusion. The magnitude of the benefits is uncertain, but for reasons detailed in our prior paper, the costs are likely small. We end this paper with suggestions for how the Bank of Japan might provide additional stimulus to the economy.

2 Intermediate indicators

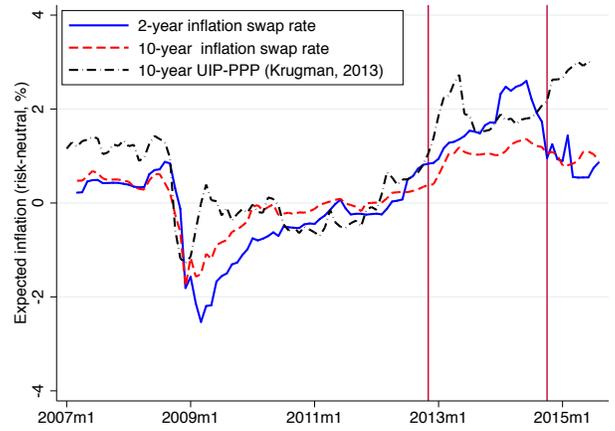
2.1 Financial markets Abenomics has continued to have large effects on financial markets. Figure 1 shows updated versions of the financial market figures in [Hausman and Wieland \(2014\)](#). Financial market developments have generally continued along their early 2014 paths. The two vertical lines correspond to November 2012, when then-candidate Shinzo Abe made clear his economic policy intentions, and to October 2014, when the Bank of Japan expanded its quantitative and qualitative easing program, raising the targeted annual increase in the monetary base from 60-70 trillion yen (12-14% of 2014 GDP) to 80 trillion yen (16% of GDP) ([Bank of Japan statement](#)).

Over 2014, the most dramatic financial developments have been to the value of the yen and to Japanese stock prices. The yen weakened from 79 per dollar in October 2012 to 102 per dollar in March 2014 and 123 per dollar in August 2015. This nominal exchange rate movement was largely reflected in Japan's trade-weighted real exchange rate. According to the broad BIS index, the real trade-weighted yen weakened 44% between October 2012 and July 2015. In July 2015, the real trade-weighted yen was weaker than at any time since 1982.⁴ Stock prices have also continued to rise rapidly. From October 2012 to March 2014, the broad Topix index rose 62%; between March 2014 and August 2015, it rose a further 36%. Of course, the coincidence of these asset price movements with expansionary monetary policy is no proof that these asset

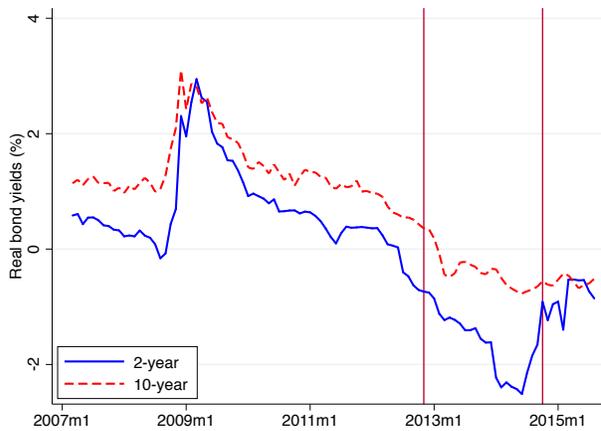
⁴This statement is based on the BIS narrow trade-weighted index, since the broad index begins only in 1994.



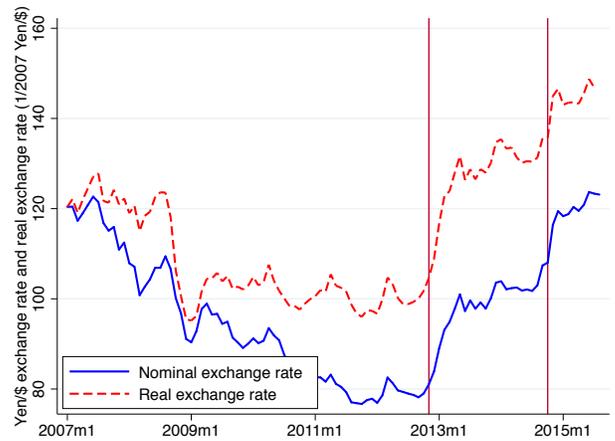
(a) Nominal bond yields



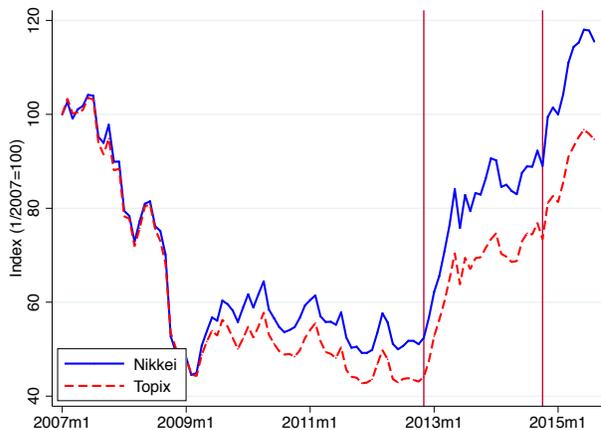
(b) Market inflation forecasts



(c) Real bond yields



(d) Exchange rates



(e) The stock market

Figure 1 – Abenomics’ financial market effects. Abenomics begins at the red line, November 2012. The second red line denotes October 2014, when quantitative easing was expanded. The UIP-PPP measure of inflation expectations is calculated using the uncovered real interest rate parity condition and U.S. TIPS. For details, see [Krugman \(2013\)](#) and [Hausman and Wieland \(2014\)](#). Real bond yields are calculated as the difference between nominal bond yields and inflation swap rates. *Sources:* See data appendix.

price movements were caused by monetary policy. The best evidence for this assertion comes from movements in asset prices on the day of significant monetary policy announcements. We documented in [Hausman and Wieland \(2014\)](#) that declines in nominal interest rates, declines in the value of yen, and increases in the stock market coincided with news of expansionary policy. These effects are consistent with time series evidence on the effects of quantitative easing in Japan ([Ito, 2014](#)). Further evidence comes from the financial market reaction to the announcement of the expansion of quantitative and qualitative easing on October 31, 2014. On this day, 30-year bond yields fell 5 basis points, the yen weakened 2.8% against the dollar, and the Topix stock market index rose 4.3%.⁵

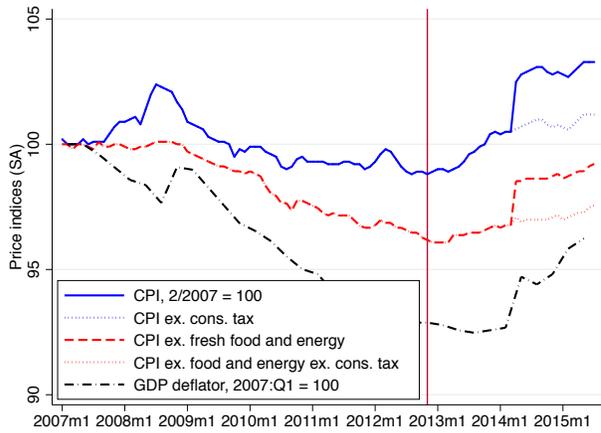
2.2 Inflation A primary goal of Abenomics, particularly the monetary arrow, is to end Japan's 15 years of deflation. So far, it has succeeded. Figure [2\(a\)](#) shows three measures of prices in Japan. In each, the effect of the three percentage point increase in the consumption tax in April 2014 is obvious. But even apart from this tax increase, prices have generally risen.

The Bank of Japan has not, however, achieved its stated goal of two percent inflation. From July 2014 to July 2015, the overall CPI rose 0.2%, while the CPI excluding food and energy rose 0.6%. We saw in figure [1\(b\)](#) that market inflation expectations generally remain below 2%. And the four other measures shown in figure [2\(b\)](#) confirm that there was little increase in inflation expectations during 2014. Firm inflation expectations, as measured by the Tankan survey,⁶ and one- and ten-year inflation expectations from Consensus forecasts remain below 2%.⁷ Interestingly, there is no evidence that Japanese households expected deflation before or after Abenomics began; according to the Bank of Japan opinion survey, they consistently expect inflation near 4%. This fits with international evidence suggesting that households and small businesses are ill-informed about inflation and monetary policy ([Kumar, Afrouzi, Coibion, and Gorodnichenko, 2015](#); [Binder, 2014](#)).

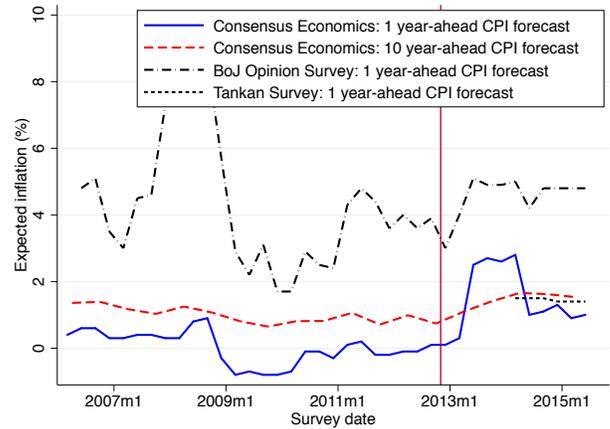
⁵The interpretation of these movements is complicated by the fact that on the same day, October 31, 2014, the Japan Government Pension Investment Fund announced that it would be purchasing more Japanese and foreign stocks instead of Japanese bonds ([Bloomberg](#)). The decline in bond yields on this day, however, suggests that the monetary policy announcement had larger financial market effects than the pension fund decision.

⁶The Tankan survey began to ask about inflation expectations only in March 2014.

⁷The hump in one-year inflation expectations in 2013 and 2014 reflects the influence of the April 2014



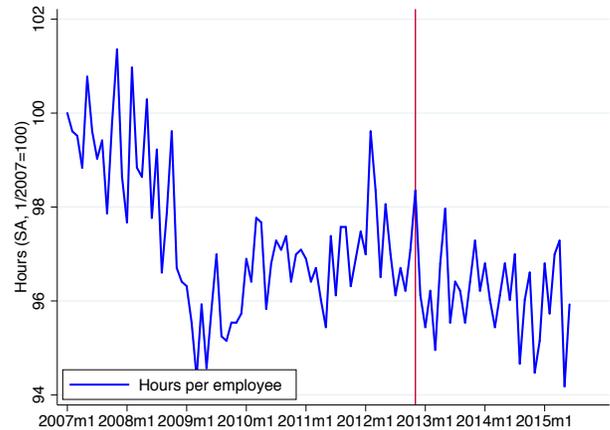
(a) Price indices



(b) Survey inflation forecasts



(c) Nominal and real earnings



(d) Hours per employee

Figure 2 – Japanese actual and expected inflation, wages and hours per employee. Abenomics begins at the vertical line, November 2012. In (a), direct effects of the consumption tax are excluded from the CPI by assuming that the consumption tax raised 12-month headline (excluding food and energy) inflation 1.9 percentage points (1.5 percentage points) in April 2014, and 2.1 percentage points (1.7 percentage points) from May 2014 through March 2015. These are the figures suggested by the [Bank of Japan](#). In (c), real wages are nominal wages deflated by the CPI excluding imputed rent (but including the consumption tax). *Sources:* See data appendix.

Three mechanisms are likely driving the incomplete adjustment of expected inflation towards the 2% target: (1) backward-looking price-setting, (2) adaptive expectations (slow updating) and / or (3) imperfect credibility. To better understand which of these factors is quantitatively most important, we conduct the following exercise: first, we estimate a Phillips curve for Japan following [Coibion and Gorodnichenko \(2015b\)](#) in order to gauge the amount of backward-looking price setting. We use inflation forecasts and output gap data⁸ to estimate a new Keynesian Phillips curve with a fraction β_1 of backward-looking firms,

$$\pi_t - E_t\pi_{t+1} = \beta_1(\pi_{t-1} - E_t\pi_{t+1}) + \beta_2x_t + \varepsilon_t. \quad (1)$$

Note that backward-looking price setting β_1 is distinct from adaptive expectations, the latter of which is contained in $E_t\pi_{t+1}$. By measuring inflation expectations directly, we capture the adaptiveness of forecasts. This allows us to take the expectations formation process as given and to then isolate the amount of backward-looking price setting necessary to explain the observed persistence of inflation.

Table 1 – Phillips Curve estimates

Dependent variable: Inflation minus expected inflation $\pi_t - E_t\pi_{t+1}$		
	OLS (1)	IV (2)
$\pi_{t-1} - E_t\pi_{t+1}$	0.22 (0.15)	0.11 (0.18)
Output Gap	0.14** (0.053)	0.13 (0.091)
p-value: vertical PC	0.38	0.59
F-statistic		9.32
R^2	0.18	0.12
Observations	27	24

Notes: Estimation of $\pi_t - E_t\pi_{t+1} = \beta_1(\pi_{t-1} - E_t\pi_{t+1}) + \beta_2x_t + \varepsilon_t$ using OLS and IV. Instruments are a lag of the output gap x_{t-1} and $\pi_{t-1} - E_{t-1}\pi_{t+1}$. Testing for a vertical Phillips curve is the t-test on β_3 in the equation $\pi_t - E_t\pi_{t+1} = \beta_1(\pi_{t-1} - E_t\pi_{t+1}) + \beta_2x_t + \beta_3E_t\pi_{t+1} + \varepsilon_t$. Newey-West standard errors in parenthesis.

consumption tax increase.

⁸We use the IMF April 2015 *World Economic Outlook* output gap data. This is not inconsistent with our argument in [Hausman and Wieland \(2014\)](#) that this measure of the output gap underestimates the possible effect of monetary policy on output in the long-run: for the Phillips curve, what is relevant is potential output in the short run.

We estimate this equation by OLS and IV on annual data from 1989 to 2015, where the instruments are a lag of the output gap x_{t-1} and lagged forecasts $\pi_{t-1} - E_{t-1}\pi_{t+1}$. We use the IV approach, standard in this literature (Coibion and Gorodnichenko, 2015b), to avoid bias due to contemporaneous supply shocks moving the output gap and expected inflation in opposite directions. The structure imposes a vertical long-run Phillips curve, a restriction not rejected by the data. Table 1 shows results; they suggest that backward-looking price setting is small, with β_1 below 0.25.

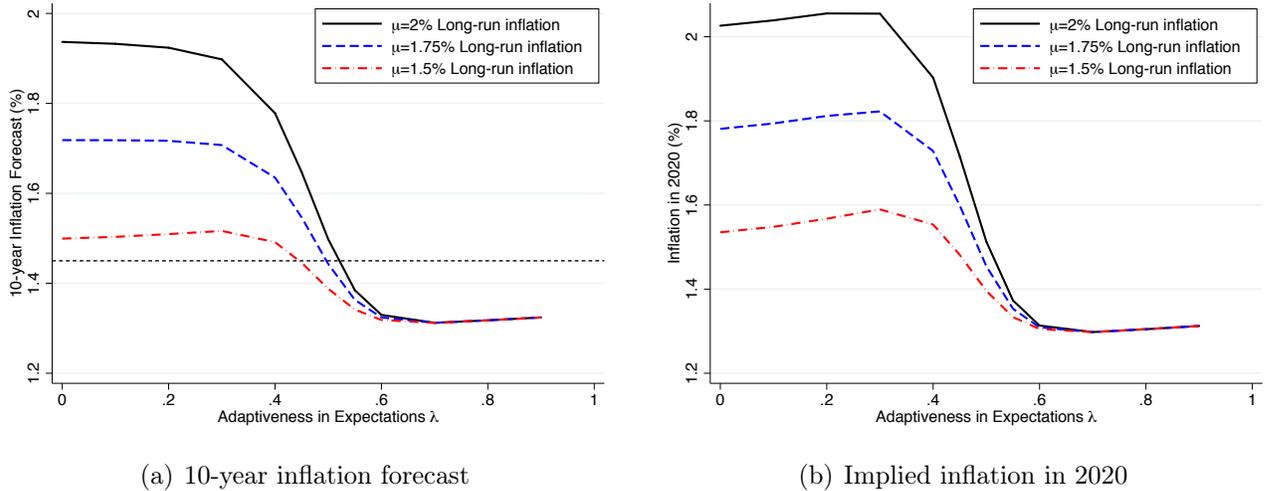


Figure 3 – The left panel plots implied 10-year inflation forecasts from solving the estimated Phillips curve (1) and expectations formations (2) for combinations of credible long-run inflation μ and adaptiveness λ . The horizontal dotted line in the left panel is the 10-year ahead inflation forecast from Consensus Economics, 1.45%. The right panel plots the implied inflation rate in 2020 for these combinations of μ and λ .

Second, given (1) we solve for the expected path of inflation using output gap forecasts and a terminal condition that inflation reach a target μ (e.g., 2%) in 2030.⁹ This corresponds to the (credible) expected rate of inflation in the very long-run. We allow for expected inflation in the Phillips curve to be partially adaptive,

$$E_t\pi_{t+1} = \lambda\pi_{t-1} + (1 - \lambda)\pi_{t+1}. \quad (2)$$

λ indexes adaptiveness, and π_{t+1} is the solution to (1). Rational expectations correspond to

⁹We linearly extrapolate the 2020 *World Economic Outlook* output gap forecast to reach zero in 2030. Results are not sensitive to this assumption since the projected output gap in 2020 is small. Results are also not sensitive to extending the time horizon at which the inflation target becomes credible.

the case $\lambda = 0$, and fully adaptive expectations correspond to $\lambda = 1$.¹⁰ By iterating on (1) and (2) until convergence, we can determine what combinations of long-run actual inflation (μ) and degree of adaptiveness (λ) can rationalize the market and professional long-run inflation forecasts. We use the OLS estimates to parameterize the Phillips curve (column 1 of table 1), but these results are very similar to the IV estimates.

In figure 3(a), we show the implied 10-year inflation forecasts for combinations of long-run inflation μ and adaptiveness λ . The inflation forecasts follow an inverse-S shape in λ . This is because the importance of λ for the forecast increases exponentially until it completely dominates the forecast. Intuitively, more adaptive expectations directly keep inflation low by increasing the weight on low past inflation. But since rational price setters correctly forecast this influence, they will also expect lower inflation, which further reduces price pressure today. Formally, inflation is a weighted average of initial inflation in 2015 and terminal inflation in 2030 (abstracting from the output gap), $\pi_t = g_t \pi_{2015} + (1 - g_t) \mu$, where g_t is given by a recursion.¹¹ The recursion implies that the weight on past inflation increases rapidly for intermediate values of λ . For $\lambda = 0$ the weight on past inflation in 2020 is $g_{2020} = 0.0005$, but it rises to $g_{2020} = 0.279$ for $\lambda = 0.3$, and increases steeply to $g_{2020} = 0.976$ for $\lambda = 0.5$. Thus, we observe a sharp drop in inflation forecasts in the range $\lambda \in [0.3, 0.5]$. As this parameter increases further, the weight on past inflation becomes so large that future inflation is almost irrelevant, and the paths converge for different levels of long-run inflation (μ).

Our simulation suggests that rationalizing the long-run 1.45% inflation forecast from Consensus Economics requires either a large degree of adaptiveness in expectations, $\lambda \approx 0.45 - 0.55$, or that forecasters believe long-run inflation (μ) will be only 1.5% or some combination. These high values for λ imply that, five years from now, the weight on the initial inflation target ranges from $g_{2020} = 0.921 - 0.994$. Thus, the higher inflation target is almost irrelevant for

¹⁰Sticky information corresponds to a generalization in which $\lambda_t = (1 - \theta)^t$, and θ is the fraction of agents updating information every year. The literature suggests that $\theta \approx 0.68 - 0.94$ (Mankiw and Reis, 2002; Mankiw, Reis, and Wolfers, 2004; Coibion and Gorodnichenko, 2015a), which given that the 2% target was announced in 2013 implies $\lambda \approx 0$ today. Thus, we view this case as being roughly captured by the $\lambda = 0$ calibration.

¹¹Specifically, the weight on initial inflation is $g_t = \prod_{i=2016}^t f_i$, where f_i is determined by the recursion $f_{2029} = \beta_1$, and $f_{i-1} = \frac{\beta_1 + (1 - \beta_1)\lambda}{1 - (1 - \beta_1)(1 - \lambda)f_i}$ for $i = 2017, \dots, 2028$.

price setting even in 2020. Consequently our simulations imply that inflation in 2020 will still be less than 1.6% if the entire deviation of current expected inflation from the 2% target is explained by adaptive expectations (figure 3(b)). This exercise suggests to us that a lack of credibility, e.g. a belief that long-run inflation will fail to reach 2%, likely plays an important role, since its absence implies such an extreme degree of sluggishness in inflation adjustment.

Along with inflation expectations, in [Hausman and Wieland \(2014\)](#) we argued that nominal wage growth would be a critical indicator of Abenomics' success. This is because nominal wage growth is both a cause and an effect of inflation expectations, and because real wages are likely to be an important determinant of consumption. Here the data continue to be disappointing. Figure 2(c) shows nominal earnings per person in the Japanese economy since 2007. There is no obvious increase in nominal earnings after Abenomics begins. Thus, the recent increase in prices (figure 2(a)) has meant a steady decline in real earnings. From the second quarter of 2014 to the second quarter of 2015, real CPI-deflated¹² earnings per employee fell 1.4%; per hour, they fell 0.9%. Cumulatively, over the three years from the second quarter of 2012 to the second quarter of 2015, real earnings per employee fell 5.0%; per hour they fell 3.7%.¹³

There are likely three principal reasons why Abenomics has yet to translate into higher nominal wages, let alone higher real wages. First, the decline in real wages reflects in part a compositional effect due to a rising share of lower-paid part-time employment ([Aoyagi and Ganelli, 2015](#); [Sommer, 2009](#)). But even among both full-time and part-time workers, real wages fell during Abenomics. Between the second quarter of 2012 and the second quarter of 2015, real hourly earnings for full-time workers fell 3.5%, and those of part-time workers fell 0.8%. Thus, a shift in the composition of employment towards part-time work does not alone explain the decline in real wages.

Second is the small change in inflation expectations, in particular expectations by firms of

¹²Following the convention of the Monthly Labour Survey from the Japanese Ministry of Health, Labour, and Welfare, we report real wages as nominal earnings deflated by the CPI excluding imputed rent.

¹³These data are from the Monthly Labour Survey, Japan's establishment employment survey. The figures from this survey include only 'regular' employees: these are employees working more than one month or who were employed for the majority of the previous two months, including part-time employees. The sample covers private, non-agricultural industries. For more details, see [Ministry of Health, Labour, and Welfare](#) and [IMF](#).

prices for their own products. In addition to asking firms about their CPI forecast, the Tankan survey asks firms what they expect to happen to prices for their own output. In the June 2015 survey, firms expected to raise their own output price by an average of 0.9% over the next year. Thus it is perhaps unsurprising that firms are reluctant to pay higher nominal wages. An exception are large exporters, which have benefited from the weak yen, making it easier for them to grant wage increases. At Toyota, for instance, workers received a 3.2% increase in monthly pay during the spring 2015 Shuntō (annual spring wage negotiations).¹⁴ However, the aggregate data show that this example is not representative.

Third, falling wages may reflect a labor market that is still weak. For those age 15 to 64, the employment to population ratio steadily rose to nearly 73% in 2014¹⁵ and, in absolute terms, Japanese unemployment is low: 3.3% in July 2015. Relative to the average unemployment rate in the 1980s of 2.5%, however, current unemployment in Japan is high. And the rise in participation and decline in unemployment has not been accompanied by an increase in monthly hours (figure 2(c)): between the second quarter of 2012 and the second quarter of 2015, average monthly hours worked per full-time employee were unchanged, while average hours for all employees fell 1.4%.

The disappointing response of wages to Abenomics has led to political pressure and tax incentives for firms to increase wages. Both prime minister Abe and governor Kuroda have pressured firms to raise wages.¹⁶ In addition to this moral suasion, in 2013 the Abe administration introduced a tax credit for firms indexed to their wage bill.¹⁷ Whatever the economic merit of such policies, however, they have not yet led to real wage growth.

¹⁴On Toyota's profits, see [Wall Street Journal](#). The wage figure excludes bonuses ([Wall Street Journal](#)).

¹⁵Most of this increase came from a rise in the female employment to population ratio from 61% in 2012 to 64% in 2014. For more on this trend, see [Posen \(2014\)](#).

¹⁶See [Wall Street Journal](#) and [Aoyagi and Ganelli \(2015\)](#). A historical analogy to the efforts of the Abe administration to persuade firms to raise wages is to the efforts of presidents Hoover and Roosevelt to persuade firms to raise wages during the U.S. Great Depression ([Rose, 2010](#); [Cole and Ohanian, 2004](#)). These policies remain controversial with the benefits of higher inflation and inflation expectations ([Eggertsson, 2012](#)) needing to be weighed against the costs of labor market distortions ([Cole and Ohanian, 2004](#); [Friedman and Schwartz, 1963](#); [Cohen-Setton, Hausman, and Wieland, 2015](#)).

¹⁷See [KPMG Japan Tax Newsletter](#) and [Aoyagi and Ganelli \(2015\)](#).

3 Output

Macroeconomic theory suggests that the monetary arrow will contribute to higher output by lowering real interest rates and weakening the yen, thus raising consumption, investment, and net exports.¹⁸ We first discuss overall growth, before turning to the behavior of consumption and net exports in more detail.

Table 2 – Macro summary statistics

Panel A: Raw data						
Year	Real GDP growth (% change)	Unemployment rate (%)	CPI inflation (%)	Money market interest rate (%)		
1974-1992 average	4.0	2.3	4.8	6.8		
1993-2007 average	1.1	4.1	0.1	0.6		
2008-2012 average	-0.2	4.6	-0.2	0.2		
2013	2.3	4.0	1.4	0.1		
2014	-0.8	3.6	0.4*	0.1		

Panel B: Adjusted for working age population						
Year	Real GDP per person age 15-64 (% change)		Multifactor productivity (% change)		Employment / pop. age 15-64 (%)	
	Japan	U.S.	Japan	U.S.	Japan	U.S.
1974-1992 average	3.1	1.5	-	-	67.4	68.1
1993-2007 average	1.4	1.9	0.7	1.1	69.3	72.5
2008-2012 average	0.5	0.1	0.3	0.7	70.8	67.8
2013	3.7	2.1	1.5	0.4	71.7	67.4
2014	0.8	2.0	-	-	72.7	68.1

*This excludes the direct effect of the April 2014 increase in the consumption tax from 5 to 8% (see [Bank of Japan](#)). Including the consumption tax, CPI inflation was 2.5%. Note: Growth rates are year-over-year except for 2013 and 2014 which are Q4 over Q4 for GDP and inflation. *Sources:* See data appendix.

3.1 Overall Growth Unfortunately, the overall growth effects of Abenomics thus far appear small. Table 2 reproduces table 1 in [Hausman and Wieland \(2014\)](#) and adds two lines showing the performance of the Japanese economy in 2013 and 2014. The table shows that relative to Japan’s experience during its two lost decades of the 1990s and 2000s, performance in 2013 was

¹⁸For monetary policy to have real effects there have to be slack resources in the economy. In [Hausman and Wieland \(2014\)](#), we argue that this is the case and that official estimates of the output gap underestimate the scope for demand-based policies.

excellent while that in 2014 was mediocre. Real GDP grew 2.3% between the fourth quarter of 2012 and fourth quarter of 2013 (panel A), which translated to 3.7% growth per working age person (panel B). This was more rapid growth than that in Japan during the boom decades of the 1970s and 1980s. Unfortunately, growth turned negative in 2014. Real GDP in Japan in 2015:Q2 was 2.2% above its 2012:Q4 level. Real gross domestic income (GDI) was 2.8% above its 2012:Q4 level.

Figure 4(a) provides a more fine-grained perspective; it shows quarterly GDP growth at an annual rate in Japan since 2007. There is a clear reversal of progress after the increase in the consumption tax from 5 to 8% in April 2014. Figure 4(a) also highlights that measured Japanese GDP growth is quite volatile,¹⁹ which makes it difficult to draw strong conclusions from one or even two or three quarters of growth. Thus figure 4(b) provides an alternative way of assessing recent performance that aggregates across several quarters. It shows contributions to growth under Abenomics compared with those during Japan’s lost decade (1995-2007) and the Great Recession (2008-2012).

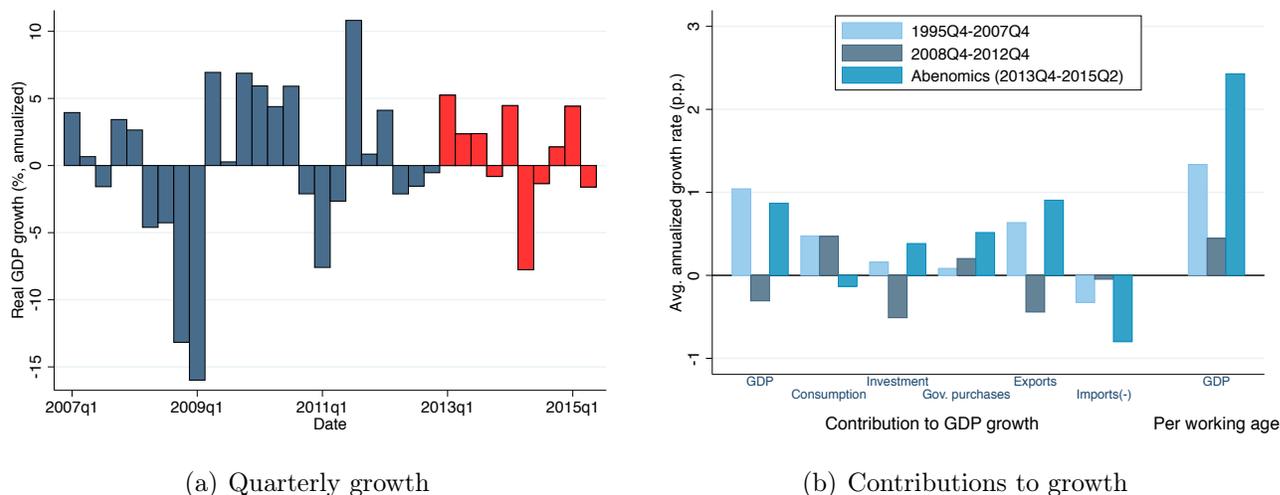


Figure 4 – Panel (a) shows annualized quarter-on-quarter GDP growth since 2007. Quarters since Abenomics began are marked in red. Panel (b) provides a comparison of annualized contributions to GDP by component during Abenomics (2012:Q4-2015:Q2), the lost decade excluding the Great Recession (1994:Q4-2007:Q4), and the Great Recession (2007:Q4-2012:Q4). Contributions are calculated as in [Japan’s national accounts](#). Panel (b) also displays annualized working-age adjusted GDP growth. *Sources:* see data appendix.

¹⁹Over the 20-year period from 1995 through the second quarter of 2015, the standard deviation of quarterly (non-annualized) GDP growth in Japan was 1.1%, while that in the U.S. was 0.6%.

The difference between the first and last columns of [figure 4\(b\)](#) (as well as [table 2](#)) indicates that any comparison of current Japanese economic performance to that in the past or to that in other countries ought to make an adjustment for Japan's unusual demographics. Over the Abenomics period, 2012:Q4 to 2015:Q2, the total Japanese population fell 0.5% and the working age (age 15-64) population fell 3.8%. Thus while overall GDP rose 2.2% between 2012:Q4 and 2015:Q2, GDP per capita rose 2.7%, and GDP per working age person rose 6.2%. By comparison, over this period, U.S. GDP per-capita rose 3.9% and GDP per working-age person rose 4.5%. This comparison may, however, exaggerate Japan's performance for two reasons. First, some of growth early in Abenomics was likely bounce-back from a late 2012 recession ([Hausman and Wieland, 2014](#)), and second the working age population adjustment ignores rising labor force participation among the working age ([table 2](#)) as well as a growing population between ages 65 and 74 ([National Institute of Population](#)), many of whom work ([Kawata and Naganuma, 2010](#)). Still, the demographically adjusted figures show that Japan's performance under Abenomics has been far from dismal.

What is disappointing is the poor performance of consumption and net exports, as well as the shortfall of growth relative to that forecast before and after Abenomics began. [Figure 4\(b\)](#) shows that in the second quarter of 2015, consumption was 0.6% *below* its level in the fourth quarter of 2012. And during Abenomics, most of the positive contribution to growth from exports has been negated by a negative contribution from imports. We turn next to an analysis of this puzzling behavior of consumption and net exports.

3.2 Evidence from the Cross-Section of Consumption Expenditures We examine cross-sectional household expenditure data to learn more about the behavior of Japanese consumption under Abenomics. Like the aggregate time series, the cross-sectional data suggest little effect of expansionary monetary policy on consumption. We use the Japanese Family Income and Expenditure Survey, a survey of approximately 9,000 Japanese households. The Japanese Statistics Bureau publishes a breakdown of survey household consumption by house

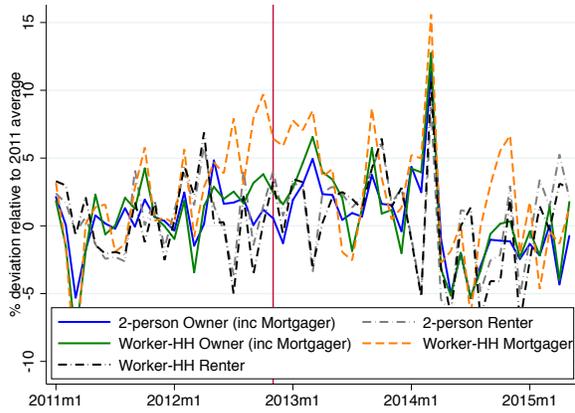
ownership status, age bins and income quintiles.²⁰ We deflate these series by the CPI and seasonally-adjust each series using an X-12 ARIMA(1,1) model with 12 monthly dummies.

The monetary policy arrow of Abenomics should have differential effects on these groups. First, higher expected (and actual) inflation constitutes a transfer from which mortgaggers ought to benefit relative to renters and home owners (Eggertsson and Krugman, 2012; Cloyne, Ferreira, and Surico, 2015). We also expect older households to be less willing to intertemporally substitute given finite horizons (Del Negro, Giannoni, and Patterson, 2015), to be more likely to be creditors, and to be less likely to benefit from any labor market improvements under Abenomics. Thus, we would expect their responses to be muted relative to younger households. The breakdown by income is more ambiguous: higher-income households may have a greater ability to intertemporally substitute (McKay, Nakamura, and Steinsson, 2015; Werning, 2015), but poorer households may increase consumption more when income or credit supply grows.

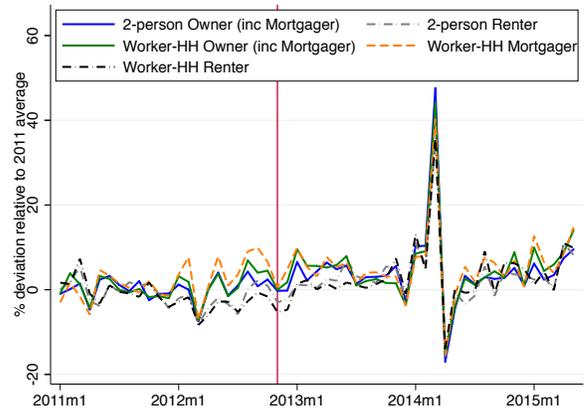
Figure 5 plots real total consumption expenditure and domestic nondurable consumption expenditures along these dimensions relative to their 2011 log levels. We do not observe strong patterns that confirm the cross-sectional predictions in the previous paragraph. The consumption of mortgaggers looks quite similar to that of renters and owners; the consumption of the elderly is similar to that of the young; and the consumption of the rich and the poor moves similarly. In part this inference is a product of the noise in the consumption series. The repeated cross-sectional nature of the data does not allow us to filter any noise. A detailed study of the micro-data might be better able to reveal differential effects of monetary policy, but with the data at hand we fail to see much evidence for large effects. This may be particularly surprising since the cleaning up of Japanese firms' balance sheets over the last decade should have increased the traction of monetary policy (Kuttner and Posen, 2001; Koo, 2003; Wieland and Yang, 2015).

In contrast to the absence of evidence for effects of monetary policy on consumption, the effects of the 3 percentage point increase in the consumption tax in April 2014 are clear.

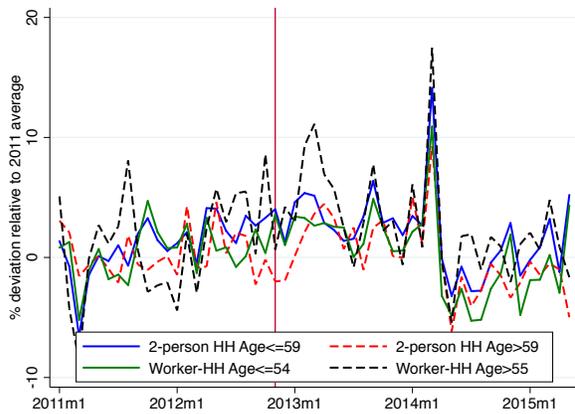
²⁰These data are only accessible from the Japanese version of the website at <http://www.e-stat.go.jp/SG1/estat/eStatTopPortal.do>. We are grateful to Hiroshi Matsushima for help with translation.



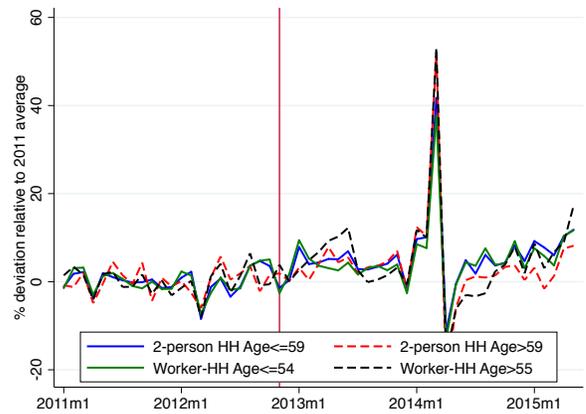
(a) Consumption expenditures: by ownership



(b) Domestic nondurables: by ownership



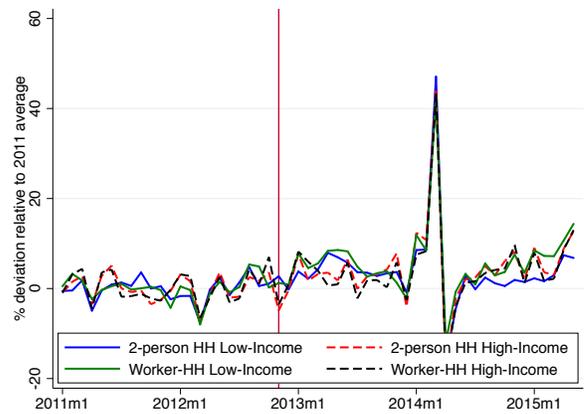
(c) Consumption expenditures: by age



(d) Domestic nondurables: by age



(e) Consumption expenditures: by income



(f) Domestic nondurables: by income

Figure 5 – Household consumption sorted along home ownership, age, and income dimensions. Raw data are from the Family Income and Expenditure Survey. Before plotting, we deflate the data by the CPI and seasonally-adjusted using an X-12 ARIMA(1,1) model with 12 monthly dummies. Abenomics begins at vertical red line (November 2012).

In advance of the consumption tax, consumption boomed. It then plummeted. That the consumption tax had large intertemporal effects whereas monetary policy did not may be surprising. But this response is in fact consistent with standard models. In appendix B, we consider a consumption choice problem over storable and non-storable nondurable consumption goods as in Barsky, House, and Kimball (2007).²¹ In this model, an anticipated consumption tax raises current consumption by lowering the real interest rate (the intertemporal price of consumption). Given the discrete nature of the consumption tax, the decrease in the real interest rate just before the tax hike is large relative to storage costs. This gives rise to a discrete increase in consumption expenditures. By contrast, if monetary policy causes only a smooth change in prices and the real interest rate, then it may not be optimal for consumers to discretely adjust their expenditures.

Likely adding to the effects of the April 2014 consumption tax increase was that at the time consumers expected the consumption tax to rise by a further 2 percentage points in October 2015.²² (In fact, after the poor performance of the Japanese economy in the second and third quarters of 2014, the Abe administration postponed the October 2015 consumption tax increase to April 2017.) This added to the incentive to buy storable goods in advance of the April 2014 tax increase.

3.3 The Puzzling Behavior of Net Exports The performance of net exports under Abenomics has also been disappointing. Between the fourth quarter of 2012 and the second quarter of 2015, real exports grew 15% and real imports grew 12%.²³ While one might have hoped for (even) stronger export growth, the larger mystery is why real import volumes have grown so rapidly despite a weaker yen and slow real output growth. Had import volumes remained flat, Japanese real GDP would have grown up to 3.8% rather than 2.2% since the end of 2012. This upper bound assumes a complete substitution of imports with domestic goods, but even for

²¹For another model of the effects of the consumption tax, see Cashin and Unayama (2015).

²²We are grateful to Takashi Unayama for making this point to us.

²³There is a break in the Japanese Balance of Payments data due to item reclassifications at the start of 2014, with some effect on the real export and import data (Bank of Japan, 2013b). In appendix A.1, we provide further details and argue that adjusting for reclassification does not change the broad story of rising real export and import volumes.

intermediate rates of substitution, growth would have been noticeably faster.

We do not have a fully convincing explanation for the recent rise in import volumes. But we can rule out three hypotheses. First, one might wonder if Japan's import prices have in fact increased following the 56% depreciation of the yen against the dollar between October 2012 and August 2015. Perhaps the combination of falling commodity prices and pricing-to-market for other imports meant the yen depreciation was not associated with higher import prices. The data suggest otherwise. Measured by the import price deflator, between the fourth quarter of 2012 and the second quarter of 2015, import prices rose 7.0%. To be sure, this is far less than the yen depreciated, but it is nonetheless substantial.

Second, one might be tempted to ascribe the increase in import volumes to substitution of fossil fuels for nuclear power in the aftermath of the 2011 Fukushima disaster. Fossil fuel imports did increase after Japan shut down its nuclear reactors, but this increase occurred before Abenomics began in late 2012. Between the first half of 2012 and the first half of 2015, the quantity of petroleum and liquid natural gas imports actually fell, while imports of coal rose less than 4%. A further problem for this hypothesis is that it cannot explain why import volumes of services rose even more rapidly than those of goods during Abenomics; between the fourth quarter of 2012 and the second quarter of 2015, real goods imports rose 9.7% while real services imports rose 22.9%.

Third, the IMF ([International Monetary Fund, 2014](#)) suggests that the real import increase reflects growing Japanese demand for foreign electronics. Like the energy hypothesis above, this cannot explain the rise of service imports. But aside from this, the limited data available suggest it is an incomplete explanation. The yen value of Japanese imports of computers and phones (broadly defined²⁴) rose by 1.2 trillion between the first half of 2012 and the first half of 2015. Had this rise not occurred, overall nominal Japanese imports would have risen 17.9% rather than 19.5%. Thus even with falling import prices for electronics and rising import prices for other goods and services, it is difficult to see how this story can account for very much of

²⁴We include computers and parts, semiconductors, audio and visual equipment, and telephony and telegraphy in this calculation.

the increase in real Japanese import volumes.

4 Medium-Run to Long-Run Outlook

Japan's lackluster economic performance over the past two years is a reminder of the difficulty of macroeconomic forecasting. Both professional and model-based forecasts have been to varying degrees too optimistic. Thus we are now more pessimistic than we were eighteen months ago about the long-run output effects of Abenomics.

Figure 6 updates figure 11 in [Hausman and Wieland \(2014\)](#). It shows long-run professional forecasts from Consensus Economics for the level of real Japanese output and consumption. In our previous paper, we compared the forecast made in October 2013 to that made in October 2012, with the increase in the level suggesting real gains from Abenomics. Unfortunately, as the solid blue line shows, actual output and consumption has been below the level forecast in October 2013. Perhaps more troubling, long-run forecasts have reverted back to their pre-Abenomics level in the case of output, and are below their pre-Abenomics level in the case of consumption. Importantly, there has been little change to Japanese demographic forecasts since 2006, so the change in output and consumption forecasts shown in figure 6 cannot be directly explained by demographic surprises.²⁵ This is worrisome both because the forecast may be correct, and because it is an indicator of lackluster growth expectations.

When Abenomics began, there were at least two reasons to be more optimistic. First, given that Abenomics reduced real interest rates by roughly one percentage point, conventional new Keynesian models suggested output gains in the 5 to 10% range ([Hausman and Wieland, 2014](#)). Second, a natural historical analogy for Abenomics is to the regime change engineered by Franklin Roosevelt in spring 1933 ([Kuroda, 2013](#); [Romer, 2014](#)). In the four years after

²⁵In 2006, the Japanese National Institute of Population and Social Security research forecast that the total Japanese population in 2015 would be 126.3 million and the working age (15-64) population would be 77.3 million. The latest projections (from 2012) are for these figures to be 126.6 million and 76.8 million ([National Institute of Population](#)). Of course, despite the accuracy of these demographic forecasts, it is possible that they were not fully incorporated into macro forecasts. The 2007 GDP forecast shown in figure 6(a) provides possible, but unclear, evidence for this. Using the 2006 population forecasts, it implies annualized per capita GDP growth from 2007 to 2015 of 1.9% and per working age person growth of 2.8%. Using actual data on the size of the Japanese labor force, the 2007 GDP forecast implies annual growth of 2.0% per member of the labor force. These are optimistic forecasts but not obviously extreme. For example, U.S. GDP per capita grew on average at 2.0% per year between 1870 and 2014 ([Jones, 2015](#)).

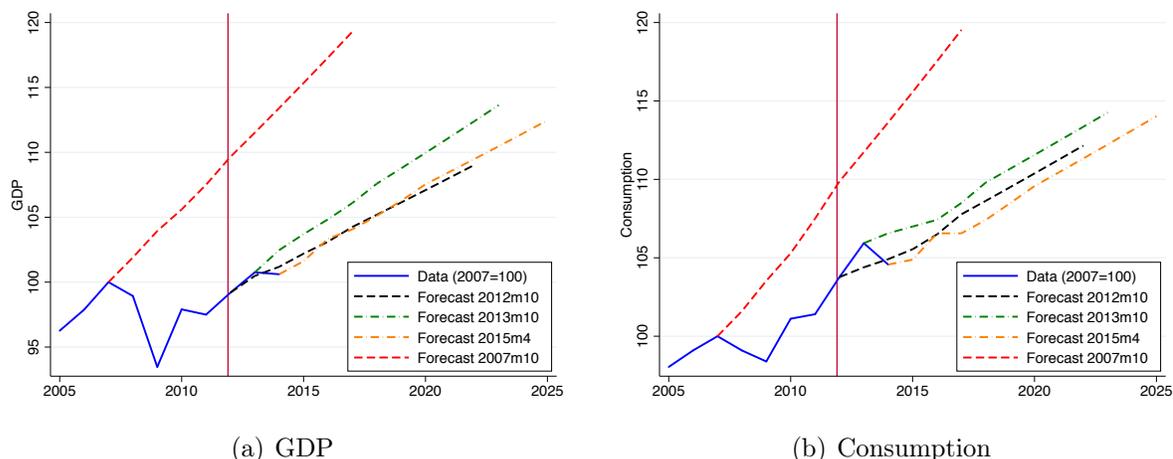


Figure 6 – Actual and forecast output and consumption. Forecasts are from Consensus Economics. Abenomics begins at vertical red line (2012).

1933, U.S. real GDP growth averaged 9.4%.

There are three reasons why these model and history based predictions may thus far have been wrong. First, perhaps slow growth is primarily due to the consumption tax increase. Unfortunately, quantifying the negative effects of the consumption tax on output is difficult given widely varying estimates of the tax multiplier in Japan (Kuttner and Posen, 2001; Keen, Pradhan, Kang, and de Mooij, 2011). However, the observed large negative effects of the consumption tax in 2014 provides evidence in favor of the high multipliers in Kuttner and Posen (2001). If the tax multiplier is large, then fiscal consolidation will continue to depress Japanese output in the medium run.²⁶

Second, perhaps Abenomics is affecting the economy only with a long lag. But estimates for conventional monetary policy suggest that the peak effect on output is reached after 18 to 24 months (Christiano, Eichenbaum, and Evans, 1999; Romer and Romer, 2004). Depending on whether one views Abenomics as having started with Abe’s political campaign in November 2012 or with the announcement of qualitative and quantitative easing in April 2013, the peak effects ought to have either already occurred or ought to occur in early 2015. For Abenomics, however, the net export response may be unusually slow. For example in July 2015—more

²⁶In the April 2015 *World Economic Outlook*, the IMF predicts that Japan’s structural budget deficit as a percent of potential GDP will decline by slightly more than one percentage point in both 2015 and 2016 and by roughly half a percentage point in 2017 and 2018.

than two years after the yen significantly weakened—Honda and Nissan announced that they would make a substantial shift towards producing cars for export in Japan.²⁷ This suggests that credibility of continued expansionary policy may be an important determinant of the net export response under unconventional monetary policy.

Third, perhaps the new Keynesian model and the 1933 analogy are poor guides to the current Japanese macroeconomy. Recent events in Japan align with a growing literature suggesting that the new Keynesian model may exaggerate the output effects of forward guidance (Del Negro et al., 2015; McKay et al., 2015). In Hausman and Wieland (2014) we also documented that the change in the real interest rate in Japan since 2012 has been much smaller than that which occurred in the U.S. after 1933. Furthermore, lower real interest rates in the U.S. occurred along with other policy changes such as financial reform, public works programs, and new regulations for businesses.²⁸ And the 1933 regime change in the U.S. occurred after a precipitous fall in output and prices.

These factors suggest that Abenomics, as is, is unlikely to substantially raise long-run output in Japan. However, the “as-is” qualifier is important, since neither the monetary arrow nor the structural arrow appear to (yet) be fully credible policies.

5 Credibility and alternative policies

We documented in sections 2.1 and 2.2 that most indicators of inflation expectations in Japan remain well below 2%, and we argued that this likely reflected imperfect credibility. One possible explanation for this lack of credibility, discussed in Hausman and Wieland (2014), is that observers doubt the political will to continue large-scale quantitative easing. Another possibility is that observers doubt the effectiveness of quantitative easing. Insofar as there are doubts about the political will to achieve to 2% inflation, it was unfortunate that the Bank of Japan’s expansion of quantitative easing in October 2014 passed with only a 5 to 4 vote. By contrast, the decisive victory of Abe’s Liberal Democratic Party in the December

²⁷See [Wall Street Journal](#).

²⁸For more on policies and outcomes in the U.S. after 1933, see [Romer \(1992\)](#), [Temin and Wigmore \(1990\)](#), and [Fishback \(2008\)](#) among many others.

2014 parliamentary elections may have increased confidence that monetary easing will continue. And in spring 2015, two members of the Bank of Japan policy board stepped down (Ryuzo Miyao and Yoshihisa Morimoto) and were replaced by Yutaka Harada and Yukitoshi Funo in a transition that likely increased support for further easing.²⁹ The appointment of these new members did not, however, lead to large changes in inflation expectations, suggesting that there are other sources of the credibility problem.

Given that quantitative easing has not (yet) produced actual or expected 2% inflation, the Bank of Japan could consider following Denmark, the Eurozone, and Switzerland in paying negative nominal interest rates on reserves. [Buiter \(2009\)](#) and [Kimball \(2013\)](#) provide a discussion of the potential benefits of this policy. In the U.S., there is a concern that negative nominal interest rates could cause a run on systemically important money market funds by forcing them to “break the buck.” But in Japan the importance of money market funds is negligible; their importance is even less than in Europe. As of 2014, money market shares amounted to \$2.5 trillion in the U.S., €427 billion (\$467 billion) in the eurozone and ¥14 trillion (\$113 billion) in Japan. As a share of broad money this amounts to 18.3% in the U.S., 4.1% in the Eurozone, and 1.1% in Japan. This suggests that paying a negative interest rate on reserves might be a practical policy in Japan.

Negative nominal rates are only one of many alternative policies available to the Bank of Japan. For instance, as discussed by [Svensson \(2003\)](#), the Bank of Japan could deliberately weaken the yen and peg the yen at a weak value. While net exports have not responded strongly to the recent yen depreciation, it is plausible that a peg could increase these effects by persuading firms of the weak yen’s permanence. Such a peg might also improve the credibility of the 2% inflation target. A practical difficulty is that exchange rate policy falls within the scope of the Ministry of Finance rather than the Bank of Japan, so that more explicit cooperation between them would be required.

²⁹See [Wall Street Journal](#) and [Wall Street Journal](#). Harada is an economist who wrote a book entitled *Reflationist Economics Has Saved Japan*. Funo is a former Toyota executive. Since his appointment, he has spoken publicly in favor of the 2% inflation target ([Bloomberg](#)). Harada replaced Ryuzo Miyao who voted in favor of the October 2014 expansion of quantitative easing, while Funo replaced Yoshihisa Morimoto who voted against this further easing ([Bank of Japan](#)).

We are hesitant to comment on more non-standard proposals, such as money-financed government expenditures or money-financed fiscal transfers. Our analysis above suggests uncertainty about what macroeconomic model applies to Japan. This implies uncertainty about how alternative policies would affect inflation and output.

6 Conclusion

This paper reviewed recent developments in Japan. Our analysis of Abenomics, and monetary policy in particular, suggests that its real effects have so far been small despite intermediate indicators, such as the real interest rate and the real exchange rate, moving in an expansionary direction.

We focussed less on the third arrow, structural reforms, in part because many reforms remain unimplemented and in part because professional forecasts suggest few more reforms will occur. Since late 2013, growth forecasts have declined (figure 6) while inflation expectations have slightly risen (figure 2(b)). This is the opposite of the expected pattern if structural reforms were seen as becoming more likely. In many standard macroeconomic models, structural reforms would raise growth expectations while lowering inflation expectations. Thus one way to interpret stable inflation expectations and declining growth expectations is as evidence that the probability that more structural reforms will happen has fallen.

That is the bad news. Good news may come in the form of the Trans-Pacific Partnership. This trade agreement would mean the liberalization of Japan's highly protected agricultural sector with a resulting large decline in food prices (Posen, 2014). Furthermore, there are no lack of positive structural reforms available to Japan. For instance, the IMF (International Monetary Fund, 2015) estimates that reforms to increase the labor force participation of women and older persons could raise potential GDP growth by 0.25 percentage points per year. And Haidar and Hoshi (2014) provide many examples of high return and low cost reforms to regulations on new and existing businesses. While such reforms are undoubtedly politically difficult, without them Abenomics may do little for long-run growth.

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ONLINE APPENDIX

A Data appendix

Balance of Payments data: Bank of Japan / Ministry of Finance

(http://www.mof.go.jp/english/international_policy/reference/balance_of_payments/ebpnet.htm).

Bank of Japan JGB holdings: Bank of Japan series BJ'MA03021034S.

Bank of Japan real export and import series: Bank of Japan series BP'BP180110001 and BP'BP180110002.

CPI: Japanese Statistics Bureau (<http://www.stat.go.jp/english/data/cpi/>).

Employed population age 15-64: OECD series LFEM64TT.

Exchange rate – nominal: Bloomberg series USDJPY.

Exchange rate – real: Bank for International Settlements trade-weighted index. We use the broad index including 61 countries. (<http://www.bis.org/statistics/eer/>.)

Female employment to population ratio: OECD series LFEM64FE (employment) and OECD series LFWA64FE (population).

German real GDP: Fachserie 18, series 1.3 from the Statistisches Bundesamt

(<https://www.destatis.de/EN/Publications/Specialized/Nationalaccounts/NationalAccounts.html>).

Government bond yields: Bloomberg series GJGBX where X is the years to maturity.

Hours and employment data: Monthly Labour Survey from the Ministry of Health, Labor and Welfare (<http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001137658>). (Table list is in Japanese, but the tables themselves are in English.)

Inflation swaps: Bloomberg series JYSWIT2, JYSWIT10.

Labor force: OECD series LFACTTTT.

Money market interest rate: IMF, International Financial Statistics.

Money market fund size: Japan: Bank of Japan series FF'FOF_FFAS162A900. Eurozone: ECB Monetary Statistics. U.S.: Federal Reserve H.6. release.

Multifactor productivity: OECD StatExtracts, multifactor productivity table.

Nominal and real earnings: Monthly Labour Survey from the Ministry of Health, Labor and Welfare (<http://www.e-stat.go.jp/SG1/estat/List.do?lid=000001137658>). (Table list is in

Japanese, but the tables themselves are in English.)

Population: For Japan, we use non-seasonally adjusted figures from the Statistics Bureau (<http://www.stat.go.jp/english/data/jinsui/2.htm>). For the U.S., we use non-seasonally adjusted figures from the Census as downloaded from FRED series POP.

Real GDP and GDP deflator: Official Japanese real GDP data are available from the Japanese Cabinet office (<http://www.esri.cao.go.jp/en/sna/menu.html>). These data begin in 1994. Prior to 1994, we use the real GDP index from the IMF's International Financial Statistics. We ratio splice this series to the official series in 1994.

Stock market: Nikkei 225 data from Yahoo finance and Topix data from Bloomberg series TPX.

Trade values and quantities: Ministry of Finance, Trade Statistics of Japan. (http://www.customs.go.jp/toukei/shinbun/happyou_e.htm.)

Unemployment rate: OECD series LRUNTTTT for annual unemployment. The July 2015 number is from Statistics Japan (<http://www.stat.go.jp/english/data/roudou/results/month/index.htm>.)

Working age employment: OECD series LFEM64TT.

Working age population: OECD series LFWA64TT. We use non-seasonally adjusted annual data and seasonally adjusted quarterly data. The quarterly data for Japan and Germany end in 2014:Q4. We extrapolate by assuming the working age population changed at the same average quarterly rate from 2014:Q4 to 2015:Q2 as it did between 2013:Q4 and 2014:Q4. For the U.S., data end in 2015:Q1. We impute the 2015:Q2 figure by assuming quarterly growth in 2015:Q2 was the same as the 2014:Q1 to 2015:Q1 average.

U.S. data in table 2: Real GDP: Federal Reserve Bank of St. Louis, FRED database series GDPCA (annual) and GDPC1 (quarterly). Other series as above.

U.S. GDP growth after 1933: NIPA table 1.1.6A.

A.1 Real Imports and Exports Data under Balance of Payments Revision Beginning in 2014, the Balance of Payments Statistics were revised to align with the guidelines of the

International Monetary Fund's *Balance of Payments and International Investment Position Manual*, 6th edition. This led to some reclassification of items between goods and services and between the current and capital account. We know of no quantitative estimate of the effect of this reclassification on the real import and real export figures. But three pieces of evidence suggest that this reclassification does not change the broad story of rising real export and import volumes.

First, an alternative series on real merchandise exports and imports from the Bank of Japan also shows increases in real exports and imports. Between the fourth quarter of 2012 and the second quarter of 2015, it shows real exports rising 6.3% and real imports rising 5.4%. Second, removing the change in real imports and real exports from 2013:Q4 to 2014:Q1 from our calculation, one sees a 9.3% increase in real exports and a 5.3% increase in real imports from 2012:Q4 and 2015:Q2. This adjustment almost certainly provides a lower bound for the actual increase in imports, given the large increase in consumption in 2014:Q1 in advance of the April consumption tax increase.

Finally, although (to our knowledge) no consistent series for real exports and imports exist across 2013 and 2014, Japan does publish a consistent series for the *nominal* value of goods imports and exports for this period. We compare this series to the equivalent nominal series from the national accounts which suffers from the data reclassification problem. The correct data show an increase in nominal goods exports from 2013 to 2014 of 9.2% and of goods imports of 10.3%. The national accounts show increases of 9.6% and 10.5%—reassuringly similar. To our knowledge the equivalent data for services are unavailable. Thus we are left more uncertain about the extent to which the services data may have been affected by reclassification. However, services only account for approximately one-quarter of the total increase in imports from 2013 to 2014, so even substantial changes in the services classification could not explain the large increase in real imports under Abenomics. Furthermore, even excluding the change from 2013:Q4 to 2014:Q1, real service imports rose 18.8% over the entire period of Abenomics, from 2012:Q4 to 2015:Q2.

B A consumption choice model

A household maximizes expected discounted utility subject to a sequence of budget constraints and the accumulation constraint for the storable nondurable good,

$$\begin{aligned}
& \max \mathbb{E} \sum_{t=0}^{\infty} \beta^t [U(C_t, F_t) - v(N_t)] \\
\text{s.t. } \lambda_t : & C_t + \frac{P_t^Z}{P_t^C} Z_t + A_t = A_{t-1}(1 + R_t) + \frac{W_t}{P_t^C} N_t \\
\nu_t : & S_t = (1 - \delta)S_{t-1} + Z_t - F_t \\
\kappa_t : & Z_t \geq 0 \\
\eta_t : & S_t \leq \bar{S} \\
\xi_t : & S_t \geq 0 \\
& F_t \leq (1 - \delta)S_{t-1} + Z_t.
\end{aligned}$$

C_t is non-storable, nondurable consumption bought at price P_t^C , A_t are real bond holdings, R_t is the real interest rate, W_t is the nominal wage and N_t is labor supply. The storable nondurable stock S_t depreciates at rate δ and can be replenished with purchases of the storable good Z_t at price P_t^Z . Consumption of the storable good F_t depletes the stock. We assume that storable good purchases and their stock cannot be negative (no shorting), and that there is a maximum storage capacity \bar{S} .

The household takes the sequence of relative prices, real wages and real interest rates as given. The first order conditions for the household are then given by

$$U_{C,t} = \lambda_t \tag{3}$$

$$U_{F,t} = \nu_t \tag{4}$$

$$v'(N_t) = \frac{W_t}{P_t^C} \tag{5}$$

$$\lambda_t = \beta \mathbb{E}[(1 + R_{t+1})\lambda_{t+1}] \tag{6}$$

$$\nu_t + \kappa_t = \lambda_t \frac{P_t^Z}{P_t^C} \tag{7}$$

$$\nu_t = \beta(1 - \delta)\nu_{t+1} + \xi_t - \eta_t \quad (8)$$

In steady-state with $\frac{P_t^Z}{P_t^C} = 1$ and $1 + R \geq 1 - \delta$ the household will not hold any stock of storable goods, so $\nu = 0$ and $S = 0$. The household will simply purchase storable goods as needed, $F = Z$, because the storing technology is too expensive relative to the return on saving.

However, if the real interest rate $1 + R_{t+1}$ temporarily drops below $1 - \delta$, then the household will optimally accumulate storable goods up to the capacity constraint \bar{S} . This is likely to happen just before a consumption tax increase when prices jump discretely, and when nominal interest rates are zero. In that case $1 + R_{t+1}$ will be temporarily negative because future consumption is more expensive. Further, by shortening the time-horizon (e.g., to days rather than quarters) we can make $1 - \delta$ arbitrarily close to one. Thus, just before the consumption tax causes a discrete price change, the condition $1 + R_{t+1} < 1 - \delta$ is satisfied, and there will be a discrete change in the purchases of durables consumption.

By contrast, if a monetary expansion only smoothly changes the perceived path of real interest rates, the previous argument breaks down. It can be the case that $1 + R_{t+1} > 1 - \delta$ over the entire transition path. Hence, the observed responses of Japanese households to the consumption tax and monetary policy are not inconsistent.