Economic Analysis

Slow Productivity Growth: Cracking the Code

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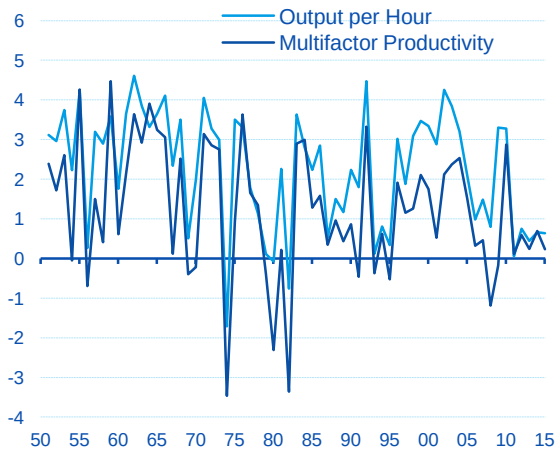
- **Rising dependency ratios explain prolonged period of slow productivity growth**
- **Subpar growth and low interest rates to persist**
- **Structural reforms are needed to boost productivity and encourage innovation**

Since the Great Recession, productivity growth has slowed at an alarming pace. For example, between 2011 and 1Q16, year-over-year growth in real output per hour worked has averaged 0.5%, compared to an average of 2.5% between 1949 and 2010, and 2.7% between 1996 and 2010. Multifactor productivity, a measure of output per unit of combined labor and capital inputs, has averaged 0.4% since 2011, compared to 1.4% between 1949 and 2010, and 1.3% between 1996 and 2010. These trends have raised alarms as productivity growth determines real wages, and a lower rate of productivity diminishes economic growth and well-being. If these trends persist, the economy could remain in a period of low equilibrium real interest rates, while income inequality and polarization continue to rise.

A significant amount of attention has been devoted to understanding this issue. In general, there are three main lines of reasoning used to explain low productivity growth.

Measurement: Economists such as Brynjolfsson and McAfee (2011 and 2014) and Hatzius and Dawsey (2015) have argued that national accounts have failed to accurately measure output and inputs, and thus, low productivity is not as it seems. In 1956, M. Abramovitz described total factor productivity a "measure of our ignorance," the unexplained difference between input and output. In other words, the way we measure certain inputs and innovations fails to account for a large increase in productivity, which if it were the case, it would be higher than officially reported.

Chart 1
Productivity Growth, YoY % Change



Source: BBVA Research & Haver Analytics

Chart 2
Productivity Growth, Annual Average, %

	Real Output Per Hour	Multifactor Productivity
1950-1969	3.3	2.3
1970-1989	1.8	0.9
1990s	2.1	1.0
2000s	2.6	1.0
2010s	1.0	0.8
2011-Last	0.5	0.4
Average: 1950-2016	**2.4**	**1.3**

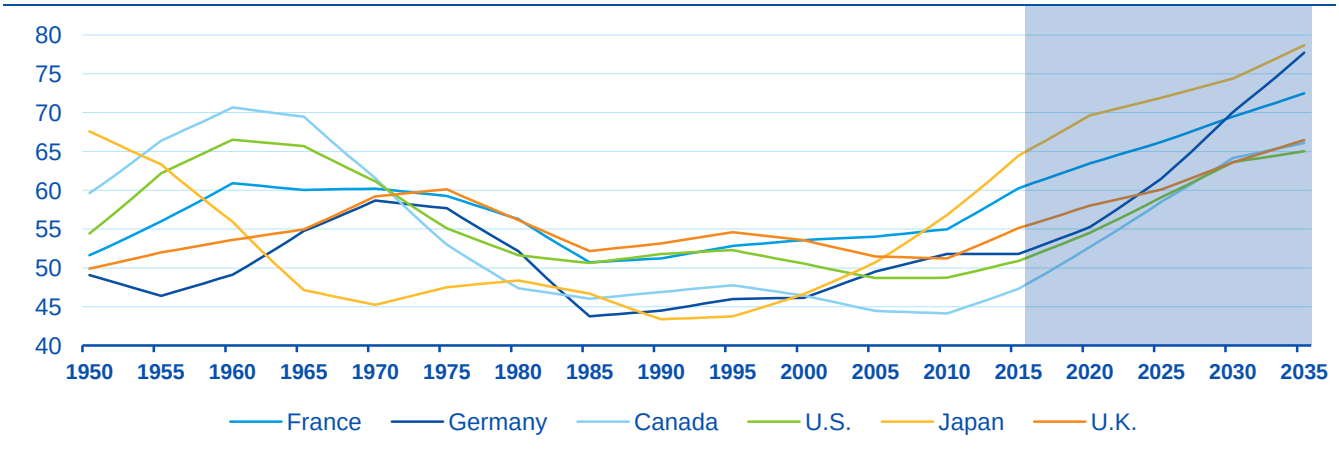
Source: BBVA Research

This so called Productivity Paradox 2.0 resembles the late 1980's when Robert Solow famously stated that "You can see the computer age everywhere except in the productivity statistics." One often cited example is the vast amounts of apps we use for free that are not accounted in national accounts, which only measure the things we pay for. Although there is likely some truth in the argument that official statistics tend to lag the speed of technological innovation, Syverson (2016) argues that this explanation falls short in explaining the $2.7Tr in "missing output".

Illusory innovation: For some economists like Gordon (2012), the wave of technological innovation that has occurred in the past decade —mobile devices, internet of things and big data —are only minor changes compared to the profound technological revolution brought about by inventions in the past, like the steam engine, the car or the personal computer. In other words, advances in e-commerce, data processing, live chats or fingerprint recognition may have a large impact at the individual level, making our lives easier and happier (increasing well-being), but do not constitute a major change in the ways we produce things. Therefore, these innovations have not resulted in major productivity gains, but instead have helped move the economy from one technology platform to another. In essence, these innovations are only boosting transitional efficiency.

Technology dispersion lag: The last explanation takes a more optimistic view. For example, Furman (2015) and some economists at the Federal Reserve have argued that the slowdown in productivity growth can be explained by the deleverage process taken place in the private sector after the Great Recession and thus, once the adjustment is complete, productivity growth will rebound. This view also warns us of previous episodes when productivity growth slowed and economists quickly jumped in to predict doomsday scenarios, only to find out that productivity edged up significantly after the innovations. In other words, new technologies take time to impact the diverse and vast sectors of our economy. In addition, technology adoption is not immediate and tends to happen over time as costs edge down and more firms and people are able to utilize these technologies. This was the case with the spinning mills of the industrial revolution, the telephone, the automobile, or the personal computer, which took decades to become common place.

Chart 3
Dependency Ratios (per 100)

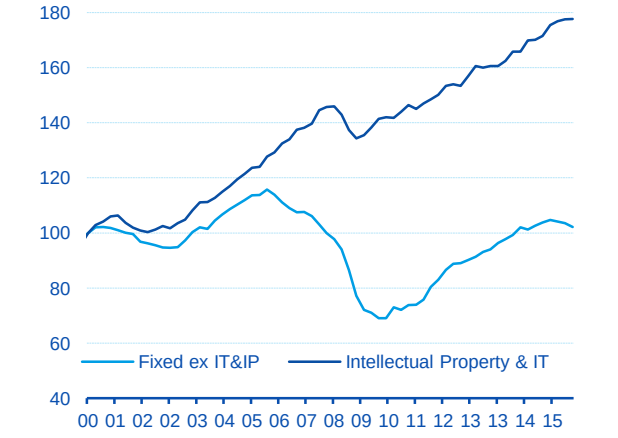


Source: BBVA Research, UN & Haver Analytics

However, while these explanations may be able to explain part of the decline or a temporary slowdown in productivity growth, they fail to provide a convincing explanation for the long and consistent period of subpar GDP growth. For example, even if consumers are not paying for some technologies, the time and income saved

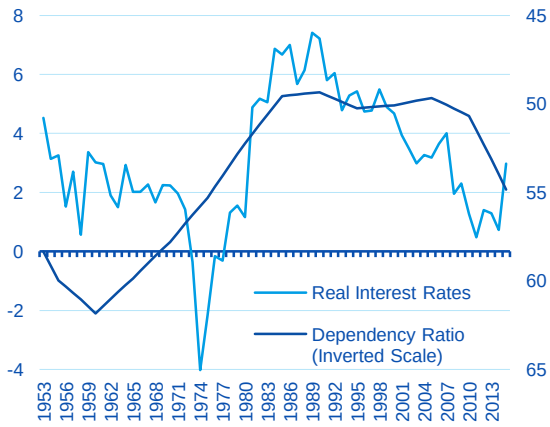
from these apps would have to be spent on other goods and services. Likewise, while technological innovations in some sectors may take some time to become widespread, the sectors more directly impacted from the innovations should experience a surge in productivity. However the data have not reflected this, as real output per hour in the manufacturing sector has averaged an annual increase of 0.4% between 2012 and 2015, compared to 3.8% between 1988 and 2011. This puzzle is even more striking considering that the productivity slowdown is evident across all major developed countries, and thus it cannot be explained by industry or geography.

Chart 4
Real Private Investment (Index: 2000Q1=100)



Source: BBVA Research & Haver Analytics

Chart 5
Real Interest rates and Dependency Ratio (%, per 100)



Source: BBVA Research, IMF and United Nations
* Australia, UK, US, France, Japan, and Canada

Therefore, an alternative explanation is necessary. In this regards, we propose that the slowdown in productivity growth is the result of a shift in the age composition in the developed world that has produced rising dependency ratios. This idea assumes that as the population ages and workers retire, consumption patterns shift (demand shock) whiles the pool of available workers shrinks (supply shock). For example, as more people retire, relative consumption of goods and services may shift away from expensive and complex goods and services to lower-value goods and services such as health and personal care and leisure. As a result, the ratio of output per hour worked could shift down if, in relative terms, the economy is producing more basic and less complex goods and services. This helps to explain the weak post-crisis recovery in the U.S. and persistently low growth in the developed world.

Higher dependency ratios could also imply lower growth of investment. For example, the need for less investment could be exacerbated if the installed capacity is above a lower steady state. This is clearly the case in the real estate sector were the large supply of vacant properties limited the construction of new single-family homes, offices and retail space for several years, while construction of multifamily properties –targeted for younger and older individuals- surged. Exports could absorb some of the excess capacity, assuming that global demand is unaffected by similar trends.

The combination of a higher dependency ratio coupled with new technologies —e-commerce, mobile services, telecommuting, etc. —could also shift the patterns of investment away from large retail and production centers to smaller high-tech facilities that require skilled labor and computing power rather than big shopping malls or industrial facilities filled with hundreds of machines and workers. This transition could raise the returns to information equipment, intellectual property and skilled labor, while reducing the returns to unskilled labor and

other types of capital. This could explain why, on average, the returns to capital have been increasing while those for labor have declined.

Meanwhile, workers nearing retirement have the incentive to increase their savings. In addition, younger generations in anticipation of having to support the older and larger generations, may save more than they would otherwise, compounding the pullback in consumption. Large public debt burdens could also drive workers to increase their savings if they anticipate their benefits will be cut.

In terms of the skills transition, the shift from more experienced workers to younger and less experience workers could drag down productivity growth, particularly if the transition is as large as the shift from Baby Boomers to Millennials. One bi-product of this transition could be a growing wage gap, as the remaining supply of high skilled individuals would bid up their wages while keeping wages of lower-skilled individuals depressed. This would be consistent with higher income inequality and lower unemployment rates.

In terms of the empirical evidence, when looking at a sample of developed countries, we find that a significant negative relationship exists between dependency ratios and productivity growth. In other words, a higher share of retirees or young people relative to the working age population will lower productivity growth. Specifically we find that every one percent increase in the dependency ratio is associated with a 1.6% drop in productivity (output per worker). Similarly, the cross-country analysis confirms that higher shares of non-working age individuals is associated with lower real interest rates and higher savings, all things being equal. In fact, the relationship between real rates and savings has strengthened since the 1980s, which could help to explain why U.S 10-year Treasuries reached historic lows this year and rates are negative in Europe.

Chart 6
Regression Results

	Full Sample*			United States		
Variables	Productivity[1]	Real Rates	Savings Rate	Productivity[1]	Real Rates	Savings Rate
Dependency Ratio	-1.585***	-0.0925***	0.161***	-2.321***	-0.100**	0.269***
	(0.208)	(0.0307)	(0.0588)	(0.220)	(0.0488)	(0.0382)
Constant	10.59***	8.028***	5.818*	13.47***	8.735***	-3.687*
	(0.820)	(1.725)	(3.526)	(0.880)	(2.707)	(2.115)
Observations	292	311	318	67	66	67
Number of countries	6	6	6	1	1	1

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: BBVA Research & Haver Analytics
* Australia, UK, US, France, Japan, and Canada
1 Log-log estimate

For the U.S., the results are similar as every one percent increase in the dependency ratio is associated with a 2.3% drop in productivity. In terms of explaining the current persistently low productivity growth regime, since 2010 the dependency ratio in the U.S. has increased by 4.5%, suggesting that productivity should be 8.4% and 12.1% less than with a stable dependency ratio. However, the observed deviation from trend is closer to 6%, suggesting that a demographic interest component, rather than dividend, is crowding out any gains from technology and innovation. In other words, the shift in age composition in the U.S. more than explains the actual slowdown in productivity, leaving the possibility that gains to productivity from the digital revolution are being overshadowed by slower moving demographic trends. As a result of lower productivity growth which would tend

to constrain output and inflation, and higher savings rate, real interest rates tend to be lower. These factors underlie a prolonged period in the U.S. of low real interest rates and higher savings.

With this in mind, it seems the slowdown in productivity is not a temporary shock, but part of a permanent shift linked to the composition of the labor force and demographics. Moreover, the results also highlight that the impact for the U.S. tends to be larger than for other developed countries, which reflects greater market efficiencies that tend to result in more volatile outcomes vis-à-vis countries were government intervention tends to smooth the impact.

To the extent that the dependency ratio remains elevated for a long period, and more is not done to promote greater labor force participation, there is no doubt that the demographic interest, rather than dividend, will begin to accumulate in the form of greater deficits, higher tax burdens, a weaker labor market and lower actual and potential growth; rising debt levels likely already speak to this challenge. The implications for policy makers are straightforward. For the Federal Reserve, lower real equilibrium interest rates will be consistent with a slower pace of monetary policy normalization and shallower path of rate increases. In terms of structural reforms, policy makers need to create the incentives for greater labor force participation. The options are vast, ranging from comprehensive immigration reform and lower labor taxes to improving existing programs such as the Work Opportunity Tax Credit and the Earned Income Tax Credit, as well as incentivizing the private sector to provide greater job flexibility and an appropriate work-life balance to keep individuals from exiting the labor force. It is also essential to provide students an affordable education that equips them with marketable skills while preserving the life force of innovation, job creation and economic growth: entrepreneurship.

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