

Policy Program
Paper

**The Relationship Between Labor
Productivity and Wages in the
Economy**

Some unpleasant inflationary arithmetic

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The Relationship Between Labor Productivity and Wages in the Economy

Some unpleasant inflationary arithmetic

Gilad Brand*

Abstract

At the end of 2015, gross real wages in the business sector were similar to what they were in 2001. On the other hand, worker productivity rose during that period by 15 percent. The opposing trends between real wages and productivity have sparked a public discussion in the last years, and it has often been claimed that the fruits of growth are not trickling down to the workers as they did in the past. This paper will demonstrate that over the years, a 1 percent rise in worker productivity was translated into a 1 percent rise in wages (unitary elasticity). Therefore, the moderate growth rate of wages is not explained by a weakening of the relationship between wages and worker productivity but by changes in the inflationary mix. For many years, there was an almost complete correlation between inflation from the consumer perspective and from the manufacturer perspective; in the last decade, though, consumer prices rose at a faster rate. This meant that inflation had a greater impact on households than it did on manufacturers in the economy. In other words, the consumer basket of a typical household appreciated faster than the average price of products and services produced in the economy. As a result, the average worker's marginal productivity eroded in relation to their consumption basket.

The change in the inflation composition is rooted in the appreciation of consumption categories particularly typical of households, and less of manufacturers, especially food and housing services. These items contributed 75 percent to the rise of the cost of living index in

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the last decade – a figure that exceeds their relative weight in the average household's consumption basket (42 percent) and is much higher than their weight in the consumer price index (11 percent). The significance of these findings is that it is advisable to implement a policy that encourages the growth of labor productivity as a necessary condition to improve workers' standard of living. However, the growth of productivity alone is not sufficient and it is necessary to address the factors that have acted to erode wages in the last decade: mainly the spike in housing prices and also the appreciation of food prices.

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Introduction

Accepted economic theory (the neoclassical theory) posits that in a state of long-term equilibrium, wages will be equal to the marginal productivity of labor. This hypothesis relies on the recognition that a company that acts to yield profits will not pay wages that are higher than the worker's marginal productivity, whereas a worker interested in earning as much as possible will not remain over time in a position that yields them less than the value of their productivity. Therefore, in a competitive market with a limited supply of labor, one can expect the workers' wage level to reflect their marginal productivity. In the short term, however, real wages might diverge from equilibrium for a number of reasons such as deficient information, market defects and various rigidities.

According to the assumptions of the accepted neoclassical models, production in the economy can be represented by a Cobb-Douglas function, which maintains a fixed ratio between marginal productivity and average productivity (labor productivity). This assumption stipulates that the ratio between average wage and productivity is constant and equal to the workers' share in the productivity pie (compensation for labor). These assumptions were set forth by Kaldor (1961), in the so-called "Kaldor's facts." According to Kaldor, historic experience shows that workers receive a fixed share of the product regardless of the capital supply or labor supply. Support for this can be found in the Israeli economy. For instance, Lavi and Zussman (2005) find that the neoclassical framework provides a good explanation for the development of real wages in the years 1968 to 1998.¹ Djivre and Menashe (2010) found that the hypothesis that the business sector product function maintains a fixed return relative to scale, and that the business sector operates with sophisticated competition, cannot be rejected.

Over the past decade, there is ample evidence in Israel and a number of other developed countries of a possible weakening of the long-term correlation between wages and productivity and as a consequence a drop in the workers' share in the product pie (OECD, 2012). Some studies have attributed the phenomenon to a drop in the power of labor unions, which weakened the workers' bargaining power (Kristal, 2007; Zeira, 2013),

¹ Lavi and Zussman (2005) analyze the factors that impact wages in the private sector in the long term and the short term, and find that in the long term there is unitary elasticity between worker productivity and average wages in the private sector.

globalization processes (OECD, 2012),² and technological advances (Karabarbounis and Neiman, 2014).³ According to another interpretation unique to the Israeli economy, the slowdown in the growth of real wages is rooted in a drop in direct tax rates, which made it possible to increase net wages at no cost for employers (Bank of Israel, 2011). Lavi and Zussman (2005) showed that real wages are established by a combination between the development of productivity and the ratio between the product price for the manufacturer and the market price of consumer products. Therefore, both factors must be taken into account when examining the correlation between the development of real wages and productivity.

This paper will examine some of those assumptions and offer an explanation for the slowdown in the growth rate of real wages.

Has the Correlation between Wages and Productivity Weakened in Israel

As stated in the previous section, there are studies that claim that in Israel the connection between wages and labor productivity has weakened. However, the Bank of Israel (2015a) examined the development of the connection between wages and worker productivity in the years 1990 to 2013 and showed that although wages have been at a standstill since the beginning of the previous decade, stagnation arrived after very rapid growth in the previous years.⁴ According to Mazar (2014), generous wage

² Jayadev (2007) finds that openness to international capital movement is negatively correlated with labor compensation.

³ When technological advances are accompanied by a rise in the level of capital depreciation, there must be a rise in equity value in order to avoid a decline in net yield (Bank of Israel, 2008). According to a different interpretation, it could have been assumed that technological improvements accompanied by a rise in education levels would help increase compensation for labor so that the latter reflect workers' investment in their human capital.

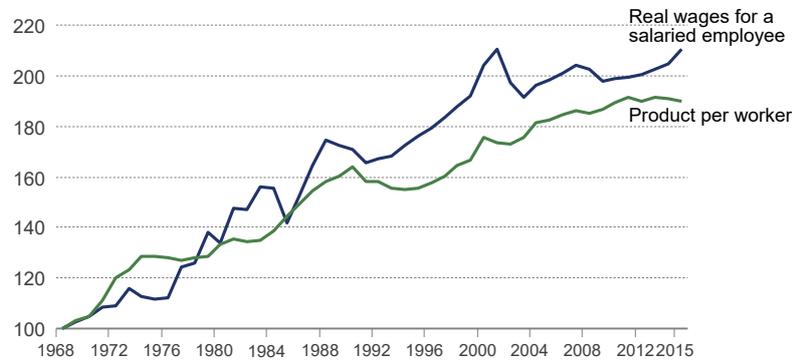
⁴ In the years 2000 and 2001, wages rose by a cumulative 10 percent. In order to examine whether the slowdown in wage growth in the following years was only a return to the long-term trend we made the following calculation: for the years 1968-1999 we estimated a regression in which the wage log is explained by the squared polynomial of the year t . Then we replaced the wage level in the years 2000-2001 with the predicted level according to the regression estimate. The results show that even with this calculation a sharp slowdown in wage growth was found: the average annual growth rate between the predicted wage in 2001 and wages in 2015 was 0.2 percent. In contrast, in the three decades preceding 2001, wages grew at an average rate of 2.1 percent a year.

agreements signed with the public sector in the mid-1990s drew with them a rapid and sharp wage increase in the private sector, to a degree that was not consistent with the rise of productivity, whereas the slowdown in wage growth in the 2000's constituted a slow return to the long-term ratio between the variables.

This explanation is very persuasive when the relationship between wages and labor productivity is examined over a long period of time (Figure 1A).⁵ However, these findings relate to the labor market as if it were of one piece, whereas an examination of the development of the correlation in the business sector alone (Figure 1B) shows that the weakening trend appears clearly when the comparison does not include the public sector. The differences between the two comparisons arise from the method of measuring product in the public sector, defined by the principles of national accounting as the market value of the inputs required for its production – mainly wage payments. As a result, there is almost complete conformity between wages and productivity in the public sector, constituting about a third of the labor input in the economy. This way of measuring might blur trends in the gap between productivity and wages, and therefore it would be more accurate to examine the relationship between wages and productivity in the business sector alone. A recommendation to that effect can be found in the OECD 2012 publication (p. 116) that addresses the issue.

⁵ Product per worker in the figure is calculated by dividing the business sector product by the number of standard employee positions. The calculation does not take into account the income of self-employed workers, and is based on the assumption that no significant changes occurred in their share of the national income. The Bank of Israel (2012b) finds an almost full correlation between compensation for work calculated in this way and compensation for work that takes the self-employed into account (p. 28).

Figure 1

A. Per worker product and real wages (in the market)**B. Product per worker and real wages (in the business sector)**

Source: Gilad Brand, Taub Center.

Data: Central Bureau of Statistics; Bank of Israel.

Another way to examine the changes in the relationship between wages and productivity is to look at workers' share in the total product (labor compensation). If there really was a slowdown in wage growth that was not accompanied by a similar trend in productivity, we should expect to see a drop in workers' share of the product. Figure 2 presents comparable data concerning labor compensation (available from 1995) for the net product of the business sector (a similar picture emerges for the gross product). As evident in the figure, it is hard to point to a drop in

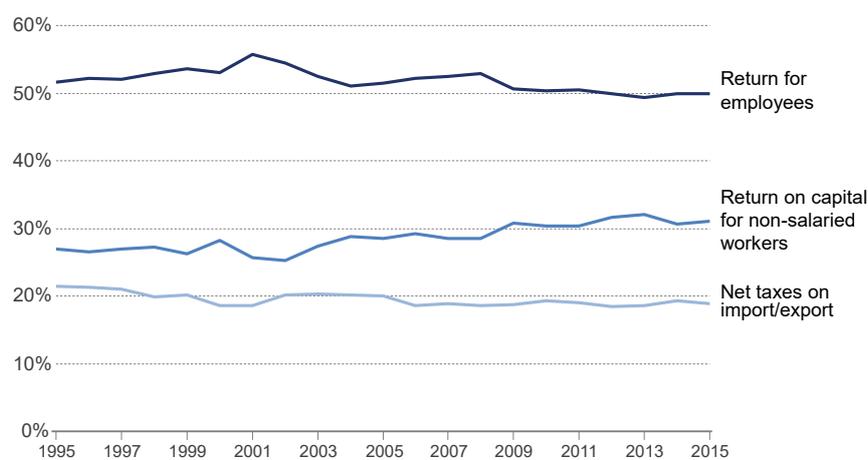
compensation for labor until 2008.⁶ After that year a certain drop began, but throughout the entire period the compensation for labor dropped by only two percentage points.⁷

Thus, the data indicates a contradiction: there was a growth of productivity without a concurrent growth of wages, but on the other hand we do not see the expected drop in the worker's share of the business sector product. The next section will discuss explanations for that contradiction.

Figure 2

Distribution of GNP (net), in market prices

In the business sector



Source: Gilad Brand, Taub Center.

Data: Central Bureau of Statistics.

⁶ This data refers only to indirect taxes and does not take into account the changes that occurred in direct taxes. A comparison of compensation for net labor with the deduction of all taxes (direct and indirect) is presented by the Bank of Israel (2012a) for the years 1997-2010. The data presented there shows that compensation for work remained relatively stable even when we take into account the drop in direct taxes, even though most of the reductions were precisely in taxation on wages. On the other hand, in compensation for capital there was a rise of 5 percentage points. The authors conclude that the reduction in direct taxes was expressed mainly by a rise in compensation for capital and not in compensation for labor (p. 26). We should note that since in many countries there was a drop in compensation for labor during that period, it is conceivable that the reduction of direct taxes prevented a possible drop in compensation for labor.

⁷ Table B8 in the Bank of Israel's annual report (2015) presents data for the breakdown of GDP without separating the share of indirect taxes, and presents similar results to those presented in the figure.

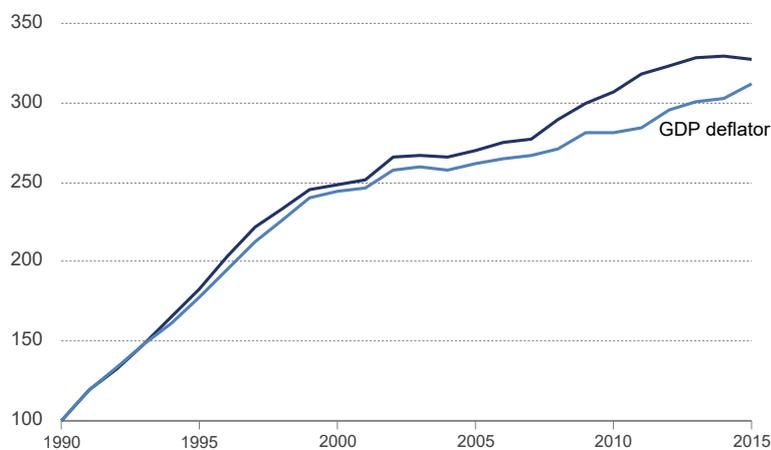
Deterioration of Terms of Trade

The studies done in the last years tested the changes in the distribution of the benefits of growth by comparing real wage growth to that of productivity. This comparison relies on the implicit assumption that the rate of price rise of products and services produced in the economy is similar to the appreciation of the workers' average consumption basket. The reason for that assumption is that a transition from nominal to real terms involves deducting the appropriate inflation for each index: from real wages we deduct the change in the price of the consumer basket of the average household (the consumer price index), whereas the economy's growth is measured by the prices of the business sector product – the price of the final products produced in the economy (manufacturer prices).⁸ However, this system is problematic: if the price indexes develop differently from each other, a mixture between the indexes might lead to reaching erroneous conclusions. Fleck and Sprage (2011) demonstrate that in the last two decades the consumer price index in the American economy has tended to rise at a higher rate than production costs (measured by the prices of business sector product). The researchers Pessoa and Van Reenen (2013), Lawrence (2015), and others find that these differences in the growth rates of the inflation indexes might explain a significant part of the gap between the wage development and productivity in the US economy during that time.

The different development of the two price indexes was also found in the Israeli case. Since the beginning of the millennium, in particular from the second half of its first decade, consumer prices rose at a higher rate than manufacturer prices (Figure 3). The gaps between the indexes result from the consumption basket for households being different from the basket of products and services produced in the economy.

⁸ In the UK, Pessoa and Reenen (2013) show that when we take into account the growth in wage costs for employers that are not included in the employee's gross salary (especially pension deductions by the employer and increase in employer's expenses for health insurance), the relationship between wages and productivity remained close over many years. Therefore, it is likely that the introduction of the obligatory deduction for pension in 2008 in Israel contributed to a certain degree to the decline in gross wages.

Figure 3
Consumer and production prices (GDP deflator)



Source: Gilad Brand, Taub Center.

Data: Central Bureau of Statistics; Bank of Israel.

Therefore, the difference in the development of the indexes undermines the credibility of the comparison of the growth of wages and productivity. In order to present an accurate picture we must compare the growth of productivity and wages in the same terms, either in nominal or real terms, while reducing them by the same inflation index. Such a comparison is presented in Figure 4, which presents wages and productivity per worker, while both are reduced by the GDP deflator. This measurement finds that the gap between the development of productivity and wage trends, presented in Figure 1 above, hardly exists at all.

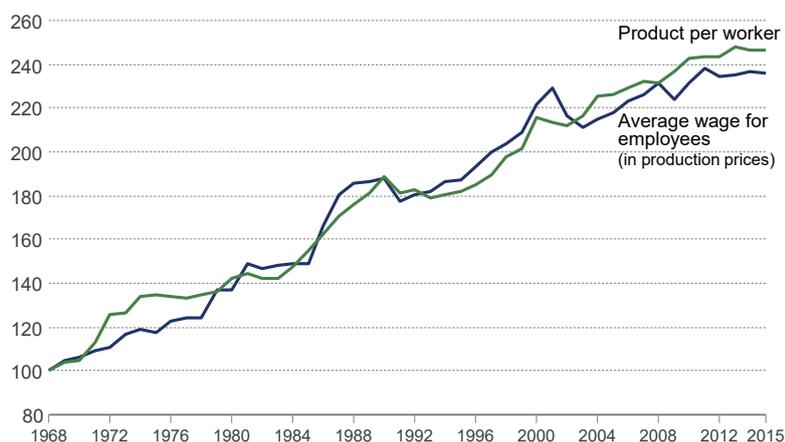
Some researchers describe this phenomenon with the term “deterioration of terms of trade,” borrowed from the field of international trade (Bivens and Mishel, 2015). According to this approach, employees produce products and services that appreciate at a relatively slow pace due to technological developments and globalization. On the other hand, consumer prices are less affected by those developments and appreciate according to the central bank’s inflation target. Unbalanced inflation erodes the growth of wages that would have derived from the increase in labor productivity if it were not for the deterioration of terms of trade. What this means is that the non-uniform development of the inflation indexes is not only a technical matter but is of real significance: the value of the

average worker's marginal productivity is eroded in relation to their consumer basket.

Figure 4

Product per worker and average wage for salaried employees reduced by GDP deflator

Business sector, Index year: 1968=100



Source: Gilad Brand, Taub Center.

Data: Central Bureau of Statistics; Bank of Israel.

An illustration of the deterioration is presented in Figures 5 and 6, which show the ratio between wages and productivity when they are reduced by an identical inflation index (Figure 5) and by two different inflation indexes (Figure 6). Again, according to the accepted models of the neoclassical theory, the worker is expected to receive a permanent share of the product, and Figure 5 presents confirmation thereof: when reduced by an identical inflation index (GDP deflator) the relation between wages and productivity is stable and the variables do not diverge from each other (the slope of the trendline is level).⁹ On the other hand, examination of wages from the worker's perspective (which is to say, reduced by the consumer price index) shows that the ratio between wages and productivity is in a significant downward trend (Figure 6).¹⁰

⁹ A hypothesis as to unit root was rejected by a df-gls test with a 5 percent significance level.

¹⁰ A kpss test confirms that the ratio between productivity per worker and wages in consumer prices is not stationary, at a 2.5 percent significance level.

Figure 5

The relation between real wages (reduced by the GDP deflator) and worker productivity

Business sector, Index year: 1968=100

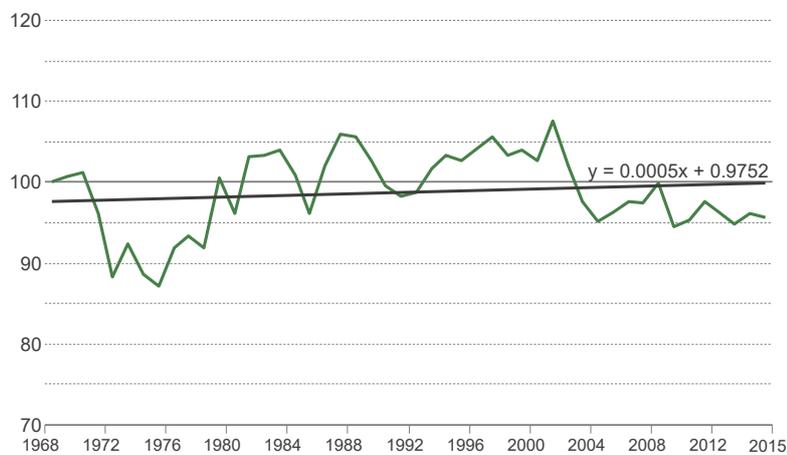
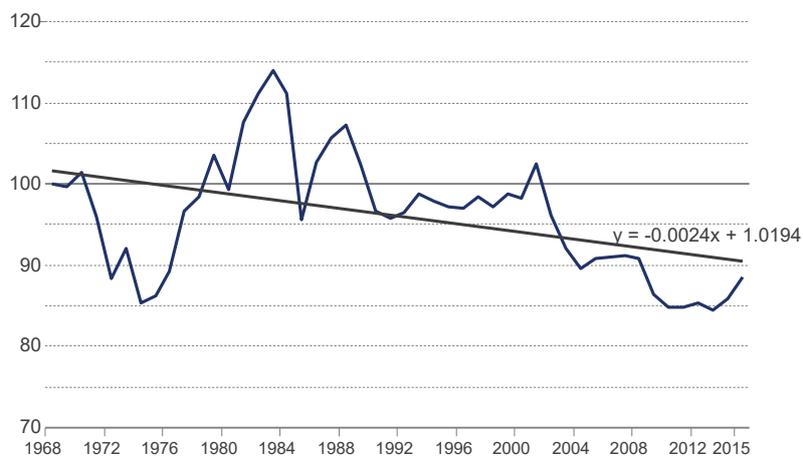


Figure 6

The relation between real wages and worker productivity

Business sector, Index year: 1968=100



Source: Gilad Brand, Taub Center.

Data: Central Bureau of Statistics; Bank of Israel.

A more formal analysis including a linear regression between variables confirms the conclusion shown in Figure 5. There is a long-term (co-integrated) correlation between wages reduced by the GDP deflator and worker productivity. Which is to say, in the short term, the wages (in production prices) may randomly digress from the level that is compatible with worker productivity, but in the long term, wages consistently return to equilibrium values. The estimation results (presented in Appendix Table 1) show that a 1-percent rise in productivity was translated in the long term into a 1-percent rise in wages (unitary elasticity). This result was also found by Lavi and Zussman (2005) and is consistent with the findings of the accepted neoclassical models. These figures reinforce the finding mentioned above: a trend of wage erosion is evident from the worker's perspective – whose buying power does not improve – but not from the employer's perspective.

Now we will test the current level of compensation for work in relation to long-term equilibrium. As discussed previously, there is a match between compensation for work and the correlation between wages and productivity – a change in the trend of the correlation should be fully expressed in compensation for work.¹¹ According to different tests, there is a ratio of co-integration between wages and productivity, which is to say that the variables move around a fixed long-term ratio that represents long-term equilibrium (Appendix Table 1). By estimating that ratio, we may conclude whether the level of compensation for work in the last years has digressed from the level of equilibrium.

In accordance with the co-interrogation method, a regression was estimated in which the productivity log explains the wage log (in manufacturer prices), and the regression residual was defined as a digression of the compensation for work from the long-term equilibrium.¹²

¹¹ The change in the level of compensation for work is equal to the difference between the change in product per worker and the change in the total payments to the production factor of labor (including benefits that are not included in the worker's gross salary, such as insurance and deductions, reduced by the GDP deflator). The comparability may be presented as follows:

$$\text{labor_share} \equiv \frac{\text{wages}}{\text{GDP}} = \frac{\text{wages/employess}}{\text{GDP/employess}} = \frac{\text{avg. wage}}{\text{productivity}}$$

¹² Formally, the equation is estimated as follows: .

$$\ln(\text{wage})_t = \beta_1 \cdot \ln(\text{gdpworker})_t + u_t$$

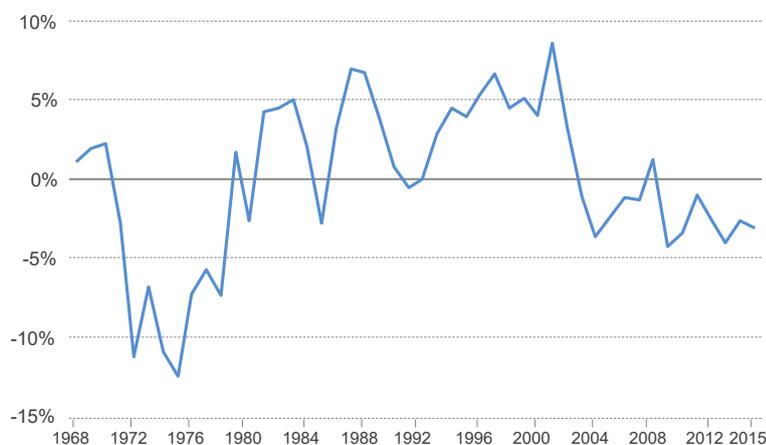
The estimation was run using Phillips and Hansen's (1990) FM-OLS method. The regression is estimated without a secant, out of the likely assumption that

The results presented in Figure 7 show that compensation for work significantly digressed from the equilibrium level during the second half of the 1990s, peaked in 2001 and quickly returned to a normal range in the years of deep recession 2002 to 2003. From 2009, wages are only 3 to 4 percent lower than the level that is consistent with worker productivity.¹³ This minor digression is consistent with the minor drop in compensation for work evident in Figure 2 above, but does not indicate a real change in the correlation trend.

Figure 7

Deviations from the long-term relationship between worker productivity and wages in the business sector

Residuals from the regression analysis where the log of worker productivity explains the log of wages reduced by the GDP deflator in the business sector



Source: Gilad Brand, Taub Center.

Data: Central Bureau of Statistics; Bank of Israel.

the individual does not earn wages when not working. When estimating an equation that does include a secant it was found that its value was not significantly different from zero.

¹³ In 2008, mandatory pension deductions were introduced, including an element of a substantial contribution by the employer. According to the Bank of Israel (2015a), including that element in the calculations would have raised the cost of labor measured in the economy by an average of 1.5 percent. Therefore, the low level of wages in the years after 2008 also expresses the increase in employers' wage expenses and not necessarily a digression from equilibrium. For example, Brender and Pulitzer (2014) find that the reduction of income tax on individuals has a negative impact on the (gross) average wage in the economy over time.

The conclusion that arises from these findings is that two factors can be identified for the slowdown in the growth of real wages: A) the rise in consumer prices was higher than the rise in the prices of products and services produced in the economy; B) a return to a wage level consistent with worker productivity, after wages had risen sharply during the second half of the 1990s, as the Bank of Israel argued (2015a).

The Contribution of Different Factors to the Slowdown in Wage Growth

So far it was demonstrated that in accordance with the findings on which the neoclassical theory is based there is a fixed long-term correlation between wages and productivity. The next section will discuss the short-term relationship between the variables and their development, to shed light on the explanatory value of the different variables for the slowdown in wage growth.

Figure 8 shows the growth rate of wages and product per worker on a three-year basis,¹⁴ which is to say that each year the growth rate is calculated for the preceding three years (similar to a moving average). This comparison finds that the slowdown period (the years since 2001) includes two separate periods: in the years 2001 to 2006, wages dropped both from the employers' perspective (wages reduced by the GDP deflator) and from the consumer's perspective (wages reduced by the consumer price index). On the other hand, in the years 2007 to 2014, wages were eroded relative to productivity only from the consumer's perspective. As explained in the previous section, this trend followed the rapid rise of the consumer price index relative to the GDP deflator. It is noteworthy that this trend reversed in 2015, when production prices rose substantially more than consumer prices.

These findings indicate that the slowdown of real salary growth is explained in the first years of the century by the adjustment of wage levels to productivity after a period of faster wage growth, and in the following years by a deterioration of terms of trade.

¹⁴ The figures are characterized by relatively high fluctuation and it is hard to draw conclusions from the comparison of specific years, therefore the comparison is presented on a three-year basis. A two-year comparison finds a similar picture, and the longer the moving average the more this finding stands out.

Figure 8

Multi-year growth rate for worker productivity and wages in GDP deflator (business sector)



Source: Gilad Brand, Taub Center.

Data: Central Bureau of Statistics; Bank of Israel.

The Causes of the Deterioration of Terms of Trade

Figure 9 presents the development of the main categories of the consumer price index in the last decade, and shows that the most notable rises occurred primarily in the items of food and housing services. To test whether that trend has changed over the years, the return on each item in the index in the last decade was examined relative to the previous decade (Figure 10). The most noteworthy finding from this comparison is that inflation in the last decade was also focused mainly on the housing services and food items. The weight of these items in the index is 42 percent but they are responsible for 75 percent of the total rise in the index during that period.¹⁵

¹⁵ Calculation of the contribution using the method developed by Regev (Regev and Brand, 2015) finds that the contribution of these items is 73 percent, compared to 75 percent using the Fisher method. The Regev method takes into account the change in the share of each item in the base period and in the ending period more accurately than the Fischer method (the Fisher and Laspeyres Index).

Figure 9
Development in the main CPI categories
 Index year: 2006=100

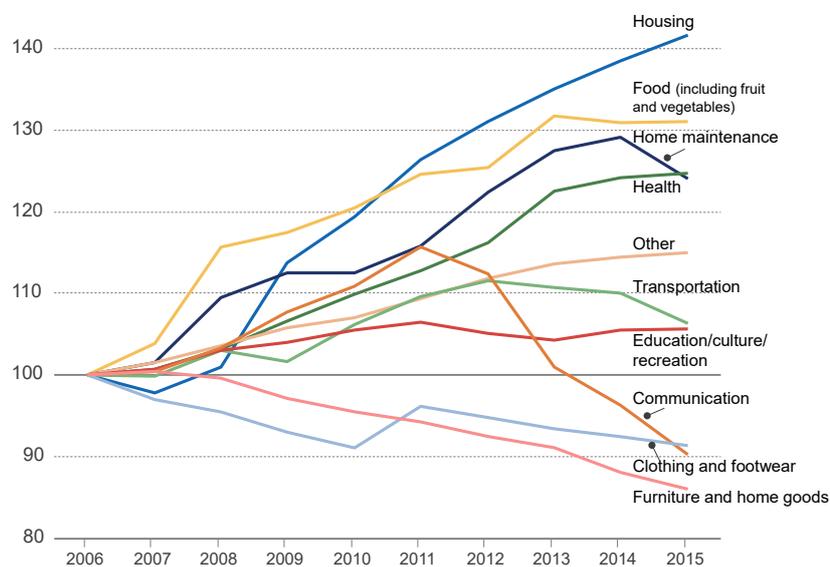
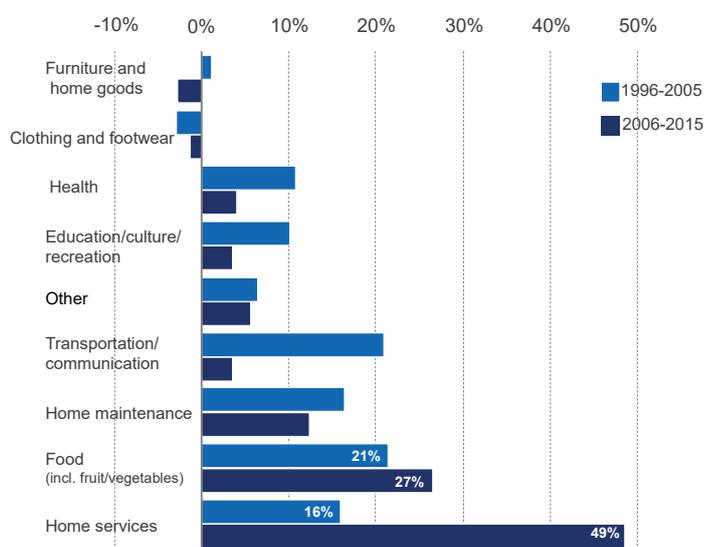


Figure 10
Contribution to the CPI by main consumer categories*



* Calculated by the Fisher method (geometric average of the Fisher and Laspeyres Index).
 Source: Gilad Brand, Taub Center. Data: Central Bureau of Statistics; Bank of Israel.

Figure 11 shows the contribution of the housing services and food items over three decades. In the last decade the contribution of these items to the consumer price index has risen relative to the past.

Figure 11

The contribution of food and housing to the rate of change in the index*



* The multi-year rate of change using the Paasche method.

Source: Gilad Brand, Taub Center.

Data: Central Bureau of Statistics; Bank of Israel.

How can this trend explain the divergence between consumer prices and manufacturer prices (GDP deflator)?

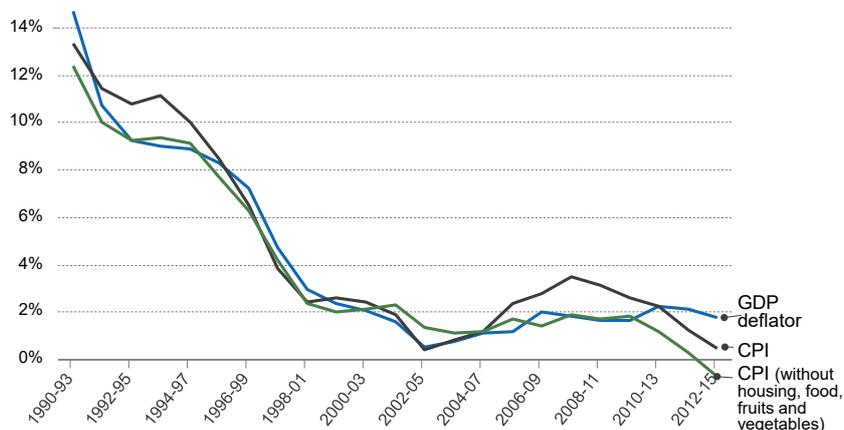
The share of the housing services item in recent years has been 25 percent of the consumer price index. On the other hand, in the GDP deflator, the item is included as part of the construction industry, whose share is only 7 percent of the GDP.¹⁶ Similarly, the share of the food item (including fruit and vegetables) in the consumer price index is 17 percent, but the food and agriculture industry together constitute only 4 percent of the GDP deflator. Therefore the sharp rise in housing and food prices may

¹⁶ Eckstein et al. (2014) showed that business real estate prices (real estate for commerce, business and so on) did not change significantly between the years 2003 and 2012. Real estate for housing rose 40 percent, so that the rise in real estate prices affected household expenses but not production costs.

be a central cause of the opening of the gap between consumer and production prices.

Figure 12 illustrates this conclusion by examining the short-term correlations between the consumer price index, the GDP deflator, and the consumer price index without food and housing. This comparison, based on growth rate over three years (similar to the moving average), indicates that the consumer price index rises faster than the GDP deflator during times of sharp rises in housing prices: the mid-1990s¹⁷ and the last decade. On the other hand, a look at the consumer price index without the housing and food items shows that this index develops similarly to the GDP deflator.

Figure 12
Multi-year growth rate in the CPI, the Index and the GDP deflator (total and without housing and food)



Source: Gilad Brand, Taub Center.
 Data: Central Bureau of Statistics; Bank of Israel.

¹⁷ During the 1990s, the real wages exceeded their level in a state of equilibrium (Figure 7 above). A comparison between Figure 7 and Appendix Figure 2 shows that the digression from the correlation between worker productivity and wages during this period, when wages are reduced by the consumer price index, was lower than the digression that would have been obtained were wages measured by the GDP deflator. Which is to say, wages from the employer perspective digressed from the equilibrium level at a higher rate than they did from the employee perspective during that period. Apparently, the rise in housing prices made a major contribution to those gaps.

This finding supports the claim that the rise in housing prices, and to a lesser extent also food prices, led to an appreciation of the consumer basket of the typical household at a higher rate than the appreciation of the economy's production basket. Therefore, the average worker's marginal productivity eroded in relation to their consumer basket, and as a result the relationship between real wages and worker productivity weakened.

It is important to emphasize that the weakening of the relationship between productivity and wages may have contributed to the slowdown in the rate of growth of real wages, but simultaneously there was also a certain slowdown in the growth of worker productivity. In the years 1975 to 2001, the average wage and worker productivity (in the business sector) grew at an identical annual rate of 1.89 percent, and beginning that year annual average worker productivity dropped to 1.14 percent (and real wages grew at the minute rate of 0.04 percent a year). This means that one could have expected a drop in the growth rate of the gross average wage even if the relationship between it and productivity had remained closer.¹⁸

Policy Consequences

This paper shows that as opposed to the common claim, the weakening of the relationship between wages and productivity is not explained by a drop in employees' bargaining power. In fact, the workers' share in the product pie remained stable in the last years, and its level does not digress from the average level over the past decades. In that light, explanations such as the drop in worker unionization are irrelevant and it is not necessary to take measures in that direction.

On the other hand, the data presented above show that most of the slowdown in the growth rate of real wages in the last decade can be attributed to the rise in housing and food prices, which eroded the value of the average worker's marginal productivity relative to their consumer basket. The significance for policy makers is that both of those items require special attention.

Previous studies indicated a sharp rise in return on equity in the production sector of the food industry in years of price rises (Bank of Israel

¹⁸ One of the reasons that led to a drop in productivity growth is the drop in the growth rate of capital stock per worker, the expansion of employment among low-skill populations, along with exhaustion of the contribution of the rise in education to the growth of productivity (Argov, 2016).

2015b), and several possible explanations were offered for the drop in the level of local competition in those years (Brand, 2015). The high profitability seen for food manufacturers is made possible by the industry's economies of scale, alongside extensive protections against competing imports. Addressing that requires measures such as a transition to direct subsidy of the agriculture industry at the expense of the current quota restrictions, exposing the food industry to competing imports from abroad, and preventing dominant importers from exploiting their market share.

The item of housing services, which as has been noted is the most influential factor in the rise of the consumer price index, is measured by the expense for rental housing while accounting for rent from tenants living in their own apartments. This means that the erosion of real wages relative to productivity demonstrated in this document is especially characteristic of housing renters, and does not represent the households living in their own apartments who have been spared the appreciation of rent prices. It can be assumed that some of them in fact increased their discretionary income as a result of the drop in the interest rates and the possible decrease in mortgage payments. Thus, for example, Kahn and Ribon (2012) found that the rise in rent led to a reduction of consumption by renters, but increased the consumption of landlords and households living in their own apartments¹⁹ – which is to say that the erosion of real wages to a certain extent represents a change in the distribution of income in the economy between renters and landlords and households living in their own apartments. Increasing the supply of housing along with other measures (Gruber, 2014) will help ease the cost of living arising from this item.

The rise of housing prices also stems from the monetary policy in recent years,²⁰ therefore these findings shed light on another less familiar channel, namely the impact of the low interest environment: the rise in the market price of consumer products relative to the production price, leading to a drop in the growth rate of real wages. On the other hand, it is likely that the low interest environment prevented a sharp slowdown in the economy's growth, which could have led to a more severe erosion of wages.

¹⁹ More specifically, it was found that among households living in their own homes the rise in rent led to an increase in consumption in the 33-35 cohort, but no significant impact was found on the consumption of younger or older households.

²⁰ Weizman and Nagar (2012) found that the monetary interest explains 43 percent of the price rise in the years 2009 to 2010.

Conclusion

At the end of 2015, gross real wages in the business sector were similar to what they were in 2001, whereas worker productivity rose 15 percent in the same years. A long-term comparison shows that a close correlation existed between wages and productivity for many years, but a weakening is seen at the beginning of the millennium. This paper refutes one of the common explanations for that – a rise in equity value at the expense of compensation for work – and shows that it is difficult to indicate a significant drop in compensation for work in the business sector. It was also found that the explanation by the Bank of Israel (2015a), according to which the slowdown in wage growth is an expression of a return to a level consistent with worker productivity after years of digression, may explain the weakening of the correlation between productivity and wages only until the middle of the first decade of the millennium.

An alternative explanation posited in this paper for the gap between productivity and wages is a change in the inflationary mix. A long-term comparison between product per worker and average wage from the employee's perspective (reduced by the GDP deflator) shows that a 1-percent rise in productivity was translated into a 1-percent rise in wages (unit elasticity), in accordance with the findings at the basis of the neoclassical theory. On the other hand, a comparison from the worker's perspective (reduced by the consumer price index) reveals a gap. The differences arise from the fact that the consumer price index appreciated in the last decade at a faster rate than the average price of products and services produced in the economy, and as a result there was an erosion in the value of the average worker's marginal productivity in relation to their consumer basket, which differs in its composition from the economy's production basket. This matter has not been adequately addressed to date, because for many years there was an almost perfect correlation between the inflation of consumer prices and production prices, but it can go a long way to explain the gap between productivity and wages.

The reason gaps opened between consumer prices and business sector product prices is that in the last decade inflation focused on consumption categories typical of households, and less so of producers – especially the food and housing items. These items contributed 75 percent to the rise of the cost of living index in the last decade – a figure that exceeds their relative weight in the average household's consumer basket (42 percent), and well beyond their weight in the consumer price index (10 percent).

The significance of these findings for policy makers is that it is not enough to implement a policy that encourages the growth of labor productivity as a necessary condition to improve workers' standard of living. It is also necessary to address the factors that worked to erode wages in the last decade – especially the rise in housing prices, and to a lesser extent the rise in food prices.

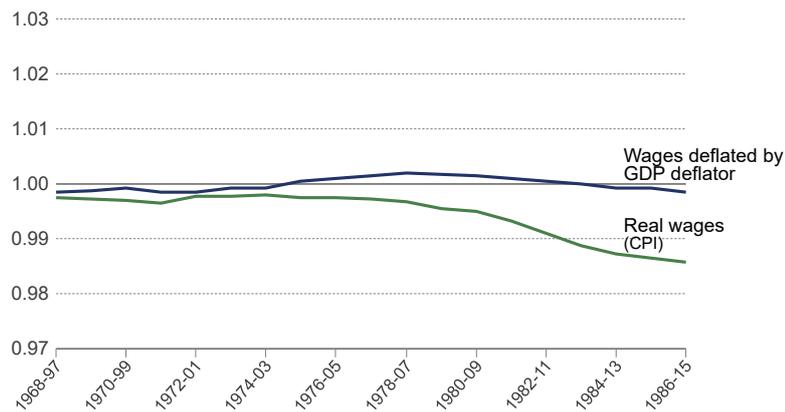
Appendix

Appendix Figure 1 presents wage elasticity relative to worker productivity, obtained from the results of a regression estimation without a secant. The estimate was made for a fixed 30-year period, and each time the estimate advances one year. The results indicate unit elasticity of wages relative to productivity when wages are reduced by the GDP deflator, and this result was found to be stable in different time periods. On the other hand, the results of the estimate for wages reduced by the consumer price index indicate a drop in the stability of the coefficient. Similar results are obtained when the estimate advances by one year each time, and the ending year, 2015, remains fixed.

Appendix Figure 1

Coefficient stability: wage elasticity relative to product per worker

Results of a rolling regression



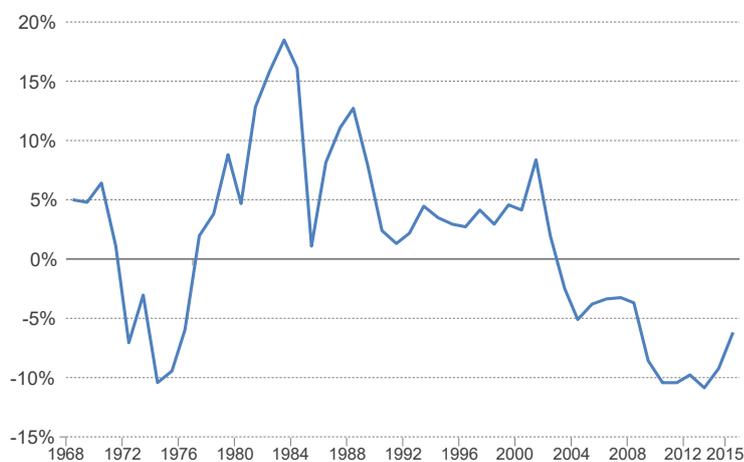
Source: Gilad Brand, Taub Center.

Data: Central Bureau of Statistics; Bank of Israel.

Appendix Figure 2

Exceptions to the long-term relationship between worker productivity and wages in the business sector

Residuals from the regression analysis where the log of worker productivity explains the log of wages deflated by the CPI



Source: Gilad Brand, Taub Center.

Data: Central Bureau of Statistics; Bank of Israel.

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