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Macroeconomic Dynamics of Labour Income Share in the United States: Evidence From MARS

Orkun Çelik¹

Abstract

Macroeconomic dynamics of labour income share (will be referred to herein as lis) in the United States for the period of 1948Q1-2019Q1 are tried to be determined in this study, where Multivariate Adaptive Regression Splines (will be referred to herein as MARS) approach is employed. In order to investigate sectoral differences, the business, non-farm, and non-finance sectors are evaluated, respectively. In accordance with the obtained results, it may be observed that the macroeconomic dynamics of lis in the business sector are productivity, export, profit, gross private domestic investment, unemployment rate, current account balance, gross domestic product, and tax revenue, respectively. Related macroeconomic dynamics of lis concerning non-farm sector are productivity, current account balance, gross private domestic investment, export, consumer price index, gross domestic product, profit, unemployment rate, and gross government investment. Aforementioned dynamics for non-finance sector are also profit, productivity, import, gross domestic product, tax revenue, gross government investment, consumer price index, and unemployment rate. In accordance with this, the most significant dynamic with respect to lis is profit in the non-finance sector, while it is productivity in the business and non-farm sectors.

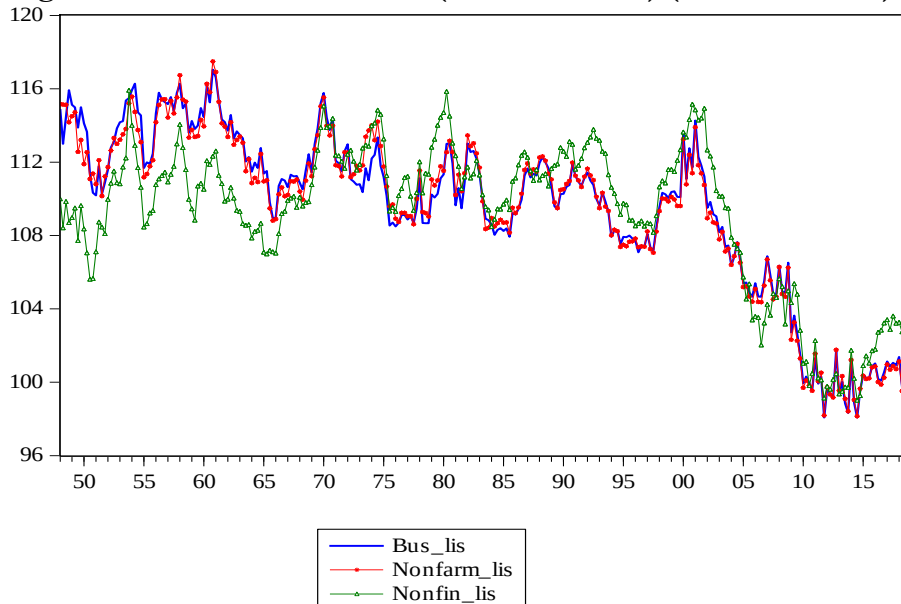
Keywords: Factor Income Distribution, Wage Share, Labour Income Share, MARS.

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1. Introduction

Over the past quarter century, the labour income share (lis) in the United States has shown a diminishing tendency and has arrived at its lowest level in the post-war period after the Great Recession². The decline of the lis in the US has stepped up since 2000, accounting for 3/4 of the decline since 1947. The lis of the private business sector in the US declined by approximately 5.4 percentage points between 1998 and 2002 and between 2012 and 2016³. The decline of lis of sectors in the US for the 1948Q1-2019Q1 period is shown in Figure 1. Accordingly, lis has decreased until 2000s but it has dramatically declined subsequently.

Figure 1. Trend of lis in the US (1948Q1-2019Q1) (index 2012=100)



² M.W. Elsby, B. Hobijn, A. Şahin, *The Decline of the US Labor Share*, in *Brookings Papers on Economic Activity*, 2013, vol. 2, 1-63.

³ J. Manyika, J. Mischke, J. Bughin, J. Woetzel, M. Krishnan, S. Cudre, *A New Look at the Declining Labor Share of Income in the United State*, McKinsey Global Institute, 2019, <https://www.mckinsey.com/~media/mckinsey/featured%20insights/employment%20and%20growth/a%20new%20look%20at%20the%20declining%20labor%20share%20of%20income%20in%20the%20united%20states/mgi-a-new-look-at-the-declining-labor-share-of-income-in-the-united-states.ashx> (accessed July 15, 2019).

Source: Own figure. The dataset is obtained from FRED⁴ database. Note: Bus_lis: The lis in the business sector, Nonfarm_lis: The lis in the non-farm Sector, Nonfin_lis: The lis in the non-finance sector.

Even though the downward decline in lis has become a global phenomenon⁵ in literature, there are few studies regarding this decline in the US. Martin and Havlicek (1977)⁶ conclude in their study that technological change affected lis negatively in cotton production for the period of years between 1952 and 1969. Wallace et al. (1999)⁷ display that unions have a significant role in re-distribution of income from the employer to employees during the post-war period. Moreover, the strikes that took place in this period also had a re-distributional effect in the country. Rios-Rull and Santaaulalia-Llopis (2010)⁸ present the existence of negative effects of productivity (Solow residual) on lis. Elsby et al. (2013)⁹ explain the decline of lis in the US over the past quarter century by means of offshoring of the labour-intensive component of the US supply chain. Abdih and Danninger (2017)¹⁰ indicate that the decrease in lis is broad-based but also express that the dimension of the aforesaid decrease varies exceedingly. Furthermore, it is stated that the decrease of lis takes place following alterations in labour institutions and technological change, but various shapes of trade integration also contribute to the situation.

⁴ FRED. <https://fred.stlouisfed.org/>.

⁵ M.Y. Abdih, M.S. Danninger, *What Explains the Decline of the US Labor Share of Income? An Analysis of State and Industry Level Data*, International Monetary Fund, IMF Working Paper No. 17/167, 2017, <https://www.imf.org/en/Publications/WP/Issues/2017/07/24/What-Explains-the-Divide-of-the-U-S-45086> (accessed July 15, 2019)

⁶ M.A. Martin, J. Havlicek, *Technological Change and Labor's Relative Share: The Mechanization of US Cotton Production*, in *Journal of Agricultural and Applied Economics*, 1977, vol. 9, n. 2, 137-141.

⁷ M. Wallace, K.T. Leicht, L.E. Raffalovich, *Unions, Strikes, and Labor's Share of Income: A Quarterly Analysis of the United States, 1949-1992*, in *Social Science Research*, 1999, vol. 28, n. 3, 265-288.

⁸ J.V. Rios-Rull, R. Santaaulalia-Llopis, *Redistributive Shocks and Productivity Shocks*, in *Journal of Monetary Economics*, 2010, vol. 57, n. 8, 931-948.

⁹ M.W. Elsby, B. Hobijn, A. Şahin, *The Decline of the US Labor Share*, in *Brookings Papers on Economic Activity*, 2013, vol. 2, 1-63.

¹⁰ M.Y. Abdih, M.S. Danninger, *What Explains the Decline of the US Labor Share of Income? An Analysis of State and Industry Level Data*, International Monetary Fund, IMF Working Paper No. 17/167, 2017, <https://www.imf.org/en/Publications/WP/Issues/2017/07/24/What-Explains-the-Divide-of-the-U-S-45086> (accessed July 15, 2019)

Bridgman (2018)¹¹ produce evidence that lis has not decreased as much once items, which do not add to capital, depreciation, and production taxes, are netted out.

As it may be observed in previous studies in literature, lis is associated with some variables such as technology, offshore, union, and strike. There is no study that directly considers all macroeconomic dynamics for lis in the US. We are of the opinion that this case creates a significant research gap in the literature.

Unlike the previous studies, macroeconomic dynamics of lis in the US are evaluated in this study. Furthermore, it shall be stated that the US is one of the countries with highest decrease in terms of lis. Therefore, determination of drivers of the aforementioned decline is quite significant for guiding policy makers. In order to realize this objective, the period of 1948Q1-2019Q1 is taken into consideration and MARS method is employed in the study. Detailed information of the process that is followed up, methodology and the dataset used are presented in Section 2, whereas findings of the study are displayed in Section 3. Section 4 comprises conclusions and discussions regarding the subject. The expected contribution of this study to literature is to comparatively determine macroeconomic dynamics of lis at sectoral level for the US.

2. Methodology and Data

MARS approach is used in the study, in order to determine the macroeconomic dynamics of the lis for the US. Related approach asserted by Friedman (1991)¹² is a multivariate non-parametric technique. The approach does not need any a-priori assumptions about the underlying functional nexus dependent-independent variable¹³. Therefore, this feature may be regarded as the main advantage of MARS approach. Additionally, it considers a specific class of basic functions as estimators rather than the original data. These functions administered as a set of functions

¹¹B. Bridgman, *Is Labor's Loss Capital's Gain? Gross Versus Net Labor Shares*, in *Macroeconomic Dynamics*, 2018, vol. 22, n. 8, 2070-2087.

¹²J.H. Friedman, *Multivariate Adaptive Regression Splines*, in *The Annals of Statistics*, 1991, vol. 19, n. 1, 1-67.

¹³C.K. Arthur, V.A. Temeng, Y.Y. Ziggah, *Multivariate Adaptive Regression Splines (MARS) Approach to Blast-Induced Ground Vibration Prediction*, in *International Journal of Mining, Reclamation and Environment*, 2020, vol. 34, n.3, 198-222.

representing the relation between the independent and the dependent variables¹⁴;

(1)

$$\hat{y} = c_0 + \sum_{m=1}^M c_m B_m(x)$$

In Equation (1), $\hat{y}$ is the dependent variable that is estimated by MARS approach. c_m indicates the coefficient of the m th basis function. c_0 and B_m also denote constant term and m th basis function, respectively¹⁵. Estimation model is generated based on this model. Hereunder;

(2)

$$\hat{Y}_t = c_0 + \sum_{m=1}^M c_m B_m X_t + \varepsilon_t$$

where $\hat{Y}_t$ is lis for the US. In order to investigate sectoral differences (business, non-farm, and non-finance sector), three different types of lis are considered as dependent variable. Independent variables of the model are current account balance (ca), productivity (prod), gross domestic product (gdp), gross private domestic investment (gpdi), gross government investment (ggi), unemployment rate (unemp), consumer price index (cpi), export (exp), import (imp), profit (prof), and tax (tax), respectively.

These variables are determined in consideration with the previous studies. Carrera et al. (2016)¹⁶ conclude that current account balance influences lis negatively. This finding is line with the theories that associate higher wages with higher aggregate demand, by means of higher consumption and less saving.

Many researchers have investigated the relationship between lis and productivity. They concluded that there is a negative nexus between them.

¹⁴ E. Quirós, Á. Felicísimo, A. Cuartero, *Testing Multivariate Adaptive Regression Splines (MARS) as a Method of Land Cover Classification of TERRA-ASTER Satellite Images*, in *Sensors*, 2009, vol. 9, n. 11, 9011-9028.

¹⁵ C.K. Arthur, V.A. Temeng, Y.Y. Ziggah, *Multivariate Adaptive Regression Splines (MARS) Approach to Blast-Induced Ground Vibration Prediction*, in *International Journal of Mining, Reclamation and Environment*, 2020, vol. 34, n.3, 203.

¹⁶ J. Carrera, E. Rodríguez, M. Sardi, *Wage Share and the Current Account. How Income Policies Transmit to the Rest of the World*, 2016, <http://www.siecon.org/online/wp-content/uploads/2016/09/CARRERA.pdf>. (accessed July 15, 2019)

Decreuse and Maarek (2015)¹⁷ indicate that investment has a positive effect on *lis*. Breuss (2010)¹⁸, Dühaupt (2013)¹⁹, Stockhammer (2017)²⁰, and Parisi (2017)²¹ demonstrate in their study that unemployment influences *lis* negatively, whereas Lawless and Whelan (2011)²² note that there is no evidence at the sectoral level to support the existence of a New Keynesian Phillips Curve.

The impact of export and import on *lis* is not clear regarding their positive or negative effects. Nevertheless, trade openness generally has a negative effect on *lis*²³. The relation between profit and labour share is expounded by Dorn et al. (2017)²⁴, using the “winner-take most” approach. Desai et al. (2007) conclude in their study, which is carried out to analyse the effect of government’s tax revenue, that the burden of corporate taxes (a part between 45% and 75%) is raised by labour with the balance borne by capital.

The dataset of this study encompasses the period of 1948Q1-2019Q1, and descriptive statistics are presented on Table 1. The observation number of the study is 285. The average of *lis* in the business sector, which is one of

¹⁷ B. Decreuse, P. Maarek, *FDI and the Labor Share in Developing Countries: A Theory and Some Evidence*, in *Annals of Economics and Statistics/Annales d'Économie et de Statistique*, 2015, vol. 119/120, 289-319.

¹⁸ F. Breuss, *Globalization, EU Enlargement and Income Distribution*, in *International Journal of Public Policy*, 2010, vol. 6, n. 1/2, 16-34.

¹⁹ P. Dühaupt, *The Effect of Financialization on Labor's Share of Income*, Institute for International Political Economy Berlin, Working Paper No. 17/2013, 2013, <http://hdl.handle.net/10419/68475> (accessed July 15, 2019).

²⁰ E. Stockhammer, *Determinants of the Wage Share: A Panel Analysis of Advanced and Developing Economies*, in *British Journal of Industrial Relations*, 2017, vol. 55, n. 1, 3-33.

²¹ M.L. Parisi, *Labor Market Rigidity, Social Policies and the Labor Share: Empirical Evidence before and after the Big Crisis*, in *Economic Systems*, 2017, vol. 41, n. 4, 492-512.

²² M. Lawless, K.T. Whelan, *Understanding the Dynamics of Labor Shares and Inflation*, in *Journal of Macroeconomics*, 2011, vol. 33, n. 2, 121-136.

²³ J. Hogrefe, M. Kappler, *The Labour Share of Income: Heterogeneous Causes for Parallel Movements?*, in *The Journal of Economic Inequality*, 2013, vol. 11, n. 3, 303-319; P. Dühaupt, *The Effect of Financialization on Labor's Share of Income*, Institute for International Political Economy Berlin, Working Paper No. 17/2013, 2013, <http://hdl.handle.net/10419/68475> (accessed July 15, 2019); M.C. Dao, M.M. Das, Z. Koczan, W. Lian, *Why is Labor Receiving A Smaller Share of Global Income? Theory and Empirical Evidence*, International Monetary Fund, IMF Working Paper No. 17/169, 2017, <https://www.imf.org/en/Publications/WP/Issues/2017/07/24/Why-Is-Labor-Receiving-a-Smaller-Share-of-Global-Income-Theory-and-Empirical-Evidence-45102> (accessed July 15, 2019).

²⁴ D. Dorn, L.F. Katz, C. Patterson, J. Van Reenen, *Concentrating on the Fall of the Labor Share*, in *American Economic Review*, 2017, vol. 107, n. 5, 180-185.

the dependent variables, was higher than other dependent variables of the model. Standard deviation of lis in non-finance sector is found to be relatively small in comparison with other dependent variables. All variables of the model are seasonally adjusted and related definitions of aforesaid variables are presented in Appendix 1.

Table 1. Descriptive statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
Bus_lis	285	109.4569	4.597109	98.075	117.037
Nonfarm_lis	285	109.3988	4.574907	98.15	117.495
Nonfin_lis	285	109.1949	4.020317	99.018	115.917
ca	285	-162.1145	228.3346	-858.332	46.58
prod	285	58.65169	25.43057	21.007	107.153
gdp	285	6118.907	6132.816	265.742	21098.83
gpdi	285	1066.502	1059.541	36.241	3783.364
ggi	285	249.3144	223.5714	7.537	715.094
unemp	285	5.76	1.64	2.57	10.67
cpi	285	109.7973	76.61041	23.58667	253.3113
exp	285	658.9059	768.2853	11.704	2543.602
imp	285	833958.9	994852.2	8936	3194665
prof	285	506.6783	568.099	27.524	1896.281
tax	285	644.2712	622.4014	31.336	2042.913

Note: Obs: Observation, Std. Dev: Standard Deviation, Min: Minimum value, Max: Maximum value.

3. Empirical Findings

All variables shall be tested by unit root tests in order to determine whether they are stationary or not before the estimation of the model is established. Therefore, Augmented Dickey Fuller (1979) (will be referred to herein as ADF) and Phillips and Peron (1988) (will be referred to herein as PP) unit root tests are taken into consideration and results of ADF and PP unit root tests are demonstrated on Table 2.

Table 2. The unit root tests

Variables	ADF		PP	
	LV	FDV	LV	FDV
	Trend	Constant	Trend	Constant
Bus_lis	-2.92 (0.156)	-10.104*** (0.000)	-3.096 (0.107)	-20.782*** (0.000)
Nonfarm_lis	-2.744 (0.218)	-9.921*** (0.000)	-2.973 (0.139)	-21.067*** (0.000)
Nonfin_lis	-2.446 (0.356)	-11.015*** (0.000)	-2.292 (0.438)	-16.231*** (0.000)
Ca	-2.403 (0.378)	-4.484*** (0.000)	-2.136 (0.526)	-17.171*** (0.000)
Prod	-0.987 (0.946)	-10.201*** (0.000)	-0.941 (0.952)	-16.167*** (0.000)
Gdp	0.711 (1.000)	-3.143** (0.024)	1.268 (1.000)	-6.49*** (0.000)
Gpdi	-1.049 (0.937)	-6.820*** (0.000)	-0.609 (0.979)	-10.417*** (0.000)
Ggi	-1.447 (0.847)	-3.143** (0.024)	-1.347 (0.876)	-17.671*** (0.000)
Unemp	-2.654 (0.256)	-4.935*** (0.000)	-2.765 (0.21)	-6.599*** (0.000)
Cpi	-2.514 (0.321)	-3.306** (0.015)	-3.116 (0.102)	-9.899*** (0.000)
Exp	-0.623 (0.978)	-6.823*** (0.000)	-0.622 (0.978)	-8.933*** (0.000)
Imp	-1.084 (0.932)	-8.573*** (0.000)	-1.058 (0.936)	-8.527*** (0.000)
Prof	-2.078 (0.558)	-11.455*** (0.000)	-2.069 (0.564)	-16.593*** (0.000)
Tax	-2.044 (0.577)	-5.778*** (0.000)	-1.61 (0.788)	-14.737*** (0.000)
Critical Values				
1% Critical	-3.989	-3.458	-3.989	-3.458
5% Critical	-3.429	-2.879	-3.429	-2.879
10% Critical	-3.13	-2.57	-3.13	-2.57

*Note: ***, **, * state $p < 0.01$, $p < 0.05$, $p < 0.1$, respectively. The values in brackets indicate probability of coefficients. LV: Level Value, FDV: First Difference Value.*

All variables are not found to be stationary at level in ADF and PP unit root tests, whereas the first differences are determined to be stationary.

While the series with I (0) is used in classical linear regression, spurious correlation could have appeared when non-stationary series are used in the model. In order to overcome spurious regression, it is necessary to get the differences of the series, which have unit roots in the model, and aforesaid series shall be used. However, this process has eliminated the memories of long-run relationships between the series²⁵. Therefore, in case there is a co-integration between series, then spurious regression problem would not be confronted in the studies, where level values of variables are used²⁶.

A set of non-stationary I (1) time series are considered to have co-integration nexus, if a particular linear combination of the series is stationary²⁷. In accordance with what is stated above, the lag criteria shall be determined for Johansen co-integration analysis. According to Likelihood ratio (hereafter LR), final production error (hereafter FPE), and Akaike's information criterion (hereafter AIC), the lag of all variables is found to be 3 for the business and non-farm sector and 1 for the non-finance sector. Johansen's co-integration analysis also indicates that there is a long-run relation among variables. Hence, all variables can be used at level.

In this study, the macroeconomic dynamics of lis for US are investigated for the period of 1948Q1-2019Q and MARS approach is employed. The results are presented on Table 3 to Table 8.

Table 3 indicates the results of lis model for the business sector. F test is significant for 1 percent, which means that the whole analysis is significant, as well. The square of R is determined to be very high. The Pearson correlation test demonstrated that the lis is highly associated with independent variables.

²⁵ G.S. Maddala, K. Lahiri, *Introduction to Econometrics* (Vol. 2), Macmillan, New York, 1992.; J. Wooldridge, *Introduction to Econometrics*. Cengage Learning, Hampshire, 2013. ; N. S Demirci, D. Özyakısır, *Finansal Gelişmişlik ve Beşeri Sermaye Arasındaki İlişki: Türkiye İçin Zaman Serileri Analizi (1971-2013)*, in *Finans Politik & Ekonomik Yorumlar*, 2017, vol. 54, n. 624, 25-39.

²⁶ W. Enders, *RATS Handbook for Econometric Time Series*, John Wiley & Sons, Inc, 1996. ; A. Petek, A. Çelik, *Türkiye'de Enflasyon, Döviz Kuru, İhracat ve İthalat Arasındaki İlişkinin Ekonometrik Analizi (1990-2015)*, in *Finans Politik & Ekonomik Yorumlar*, 2017, vol. 54, n. 626, 69-87.

²⁷ P. Wang, *Financial Econometrics*, Routledge, 2009.

Table 3. The results of the best model for the business sector

	Basis Functions	Coefficients
CT	-	94.80
BF1	max(0, prod-23.772)	1.74
BF2	max(0, prod-25.935)	-1.55
BF3	max(0, prod-82.878)	-0.59
BF4	max(0, 1201.67-gpdi)	0.01
BF5	max(0, 418.727-exp)	-0.02
BF6	max(0, 737.311-prof)	0.03
BF7	max(0, -89.411-ca) * max(0, 82.878-prod)	0.00
BF8	max(0, ca- -89.411) * max(0, 82.878-prod)	0.00
BF9	max(0, 82.878-prod) * max(0, unemp-6.4)	0.10
BF10	max(0, 82.878-prod) * max(0, 6.4-unemp)	-0.06
BF11	max(0, 82.878-prod) * max(0, 19.365-exp)	0.01
BF12	max(0, 30.29-prod) * max(0, 737.311-prof)	0.00
BF13	max(0, prod-30.29) * max(0, 737.311-prof)	0.00
BF14	max(0, 510.33-gdp) * max(0, 1201.67-gpdi)	0.00
BF15	max(0, 8362.66-gdp) * max(0, unemp-6)	0.00
BF16	max(0, 8362.66-gdp) * max(0, 6-unemp)	0.00
BF17	max(0, 8362.66-gdp) * max(0, 153.08-tax)	0.00
BF18	max(0, gpdi-1201.67) * max(0, unemp-4.23333)	0.00
BF19	max(0, 1201.67-gpdi) * max(0, 105.844-prof)	0.00
BF20	max(0, 53.775-exp) * max(0, 737.311-prof)	0.00
BF21	max(0, exp-53.775) * max(0, 737.311-prof)	0.00
	F test	550*** (0.000)
	R ²	0.978
	Pearson Correlation Coefficient	0.989*** (0.000)

Note: All variables are significant for 1 percent. BF: Basis function. CT: Constant term.

As it may be observed on Table 3, in the business sector, the effect of productivity on lis is positive (as coefficient is 1.74) in case productivity is more than 23.772 in BF1. Nevertheless, it has a negative impact on lis (as coefficients are -1.55 and -0.59) in case productivity is more than 25.935 and 82.778 in BF2 and BF3. In consideration with this data, it means that the lis decreases, when productivity increases. These findings are

consistent with the results of Bentolila and Saint-Paul (2003)²⁸, Guscina (2006)²⁹, Jayadev (2007)³⁰, Kristal (2010)³¹, Hogrefe and Kappler (2013)³², Bassanini and Manfredi (2014)³³, Young and Lawson (2014)³⁴, Bengtsson (2014)³⁵, Perugini et al. (2017)³⁶. Additionally, gross private domestic investment, export and profit have slight effect on the lis. In BF4, it affects the lis positively, in case gross private domestic investment is less than 1201.67 billion dollars.

In BF5, if export is less than 418.727 billion dollars, then it has a negative impact on lis. Moreover, BF6 indicates that the variable influences lis positively, if profit is less than 737.311 billion dollars. However, this result does not correspond to the study of Dorn et al. (2017). Therefore, profit may have a positive effect on lis until it reaches a certain level. In cross-correlation, BF9 demonstrates that these variables have positive effect on lis in case productivity is smaller than 82.878 and unemployment rate is greater than 6.4. Nevertheless, BF10 shows that these variables induce to reduce lis, in case productivity is smaller than 82.878 and unemployment rate is smaller than 6.4.

Table 4 displays the significance levels of independent estimators for lis in the business sector. In accordance with the results, the most outstanding variable is productivity with regards to lis of the business sector in the US.

²⁸ S. Bentolila, G. Saint-Paul, *Explaining Movements in the Labor Share*, in *Contributions in Macroeconomics*, 2003, vol. 3, n. 1.

²⁹ A. Guscina, *Effects of Globalization on Labor's Share in National Income*, International Monetary Fund, Working Paper No. 06/294, 2006, <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Effects-of-Globalization-on-Labors-Share-in-National-Income-19244> (accessed July 15, 2019)

³⁰ A. Jayadev, *Capital Account Openness and the Labour Share of Income*, in *Cambridge Journal of Economics*, 2007, vol. 31, n. 3, 423-443.

³¹ T. Kristal, *Good Times, Bad Times: Postwar Labor's Share of National Income in Capitalist Democracies*, in *American Sociological Review*, 2010, vol. 75, n. 5, 729-763.

³² J. Hogrefe, M. Kappler, *The Labour Share of Income: Heterogeneous Causes for Parallel Movements?*, in *The Journal of Economic Inequality*, 2013, vol. 11, n. 3, 303-319.

³³ A. Bassanini, T. Manfredi, *Capital's Grabbing Hand? A Cross-Country/Cross-Industry Analysis of the Decline of the Labour Share*, OECD, Working Paper No. 133, 2012, <https://www.oecd-ilibrary.org/docserver/5k95zqs4bxt-en.pdf?expires=1590182407&id=id&accname=guest&checksum=CC8C9F00F05B065B49F8E6B675516ACE> (accessed July 15, 2019).

³⁴ A.T. Young, R.A. Lawson, *Capitalism and Labor Shares: A Cross-Country Panel Study*, in *European Journal of Political Economy*, 2014, vol. 33, 20-36.

³⁵ E. Bengtsson, *Do Unions Redistribute Income from Capital to Labour? Union Density and Wage Shares since 1960*, in *Industrial Relations Journal*, 2014, vol. 45, n. 5, 389-408.

³⁶ C. Perugini, M. Vecchi, F. Venturini, *Globalisation and the Decline of the Labour Share: A Microeconomic Perspective*, in *Economic Systems*, 2017, vol. 41, n. 4, 524-536.

Moreover, *lis* is also affected by export, profit, gross private domestic investment, unemployment, current account balance, gross domestic product, and tax, respectively.

Table 4. Significance levels of independent variables for the business sector

Variables	GCV	RSS
prod	100	100
Exp	28.9	29.5
prof	28.9	29.5
gpdi	25.8	26
unemp	25.8	26
Ca	21.4	21.6
Gdp	20	20.4
Tax	11.1	11.5

Note: GCV: Generalized cross validation, RSS: Residual sums of squares.

The results of *lis* in the non-farm sector in the US are presented on Table 5. The F test result is found to be significant for 1 percent, which also displays that the whole analysis is significant as well. The square root of R is also very high in the model. The Pearson correlation test results demonstrate that *lis* is highly associated with the independent variables of the model. In accordance with the aforementioned results, in case productivity is greater than 55.48, it contributes to the increase in *lis* (as coefficient is 2.914) and productivity being smaller than 82.88 also affects *lis* in a positive manner.

Table 5. Results of the best model for the non-farm sector

	Basis Functions	Coefficients
CT	-	21.260
BF1	max(0, prod-55.483)	2.914
BF2	max(0, 82.878-prod)	3.564
BF3	max(0, prod-82.878)	-3.285
BF4	max(0, 174.491-ggi)	0.132
BF5	max(0, unemp-3.4)	13.021
BF6	max(0, unemp-3.73333)	-10.880
BF7	max(0, 5.13333-unemp)	2.994
BF8	max(0, unemp-5.13333)	-2.521
BF9	max(0, 35-cpi)	-1.953
BF10	max(0, 77.494-prof)	0.091
BF11	max(0, prof-77.494)	-0.003
BF12	max(0, -109.201-ca) * max(0, 82.878-prod)	0.002
BF13	max(0, ca- -109.201) * max(0, 82.878-prod)	0.00
BF14	max(0, 82.878-prod) * max(0, 4084.25-gdp)	0.00
BF15	max(0, 82.878-prod) * max(0, gpdi-280.858)	-0.001
BF16	max(0, 82.878-prod) * max(0, exp-625.287)	0.001
BF17	max(0, 82.878-prod) * max(0, 625.287-exp)	-0.001
BF18	max(0, 82.878-prod) * max(0, prof-342.391)	-0.001
BF19	max(0, 1230.61-gdp) * max(0, unemp-4.23333)	0.001
BF20	max(0, gdp-1230.61) * max(0, unemp-4.23333)	0.00
BF21	max(0, unemp-3.4) * max(0, cpi-89.7667)	0.033
BF22	max(0, exp-19.365) * max(0, 77.494-prof)	0.008
	F test	583.6*** (0.000)
	R ²	0.98
	Pearson Correlation Coefficient	0.99*** (0.000)

Note: All variables are significant for 1 percent. BF: Basis function. CT: Constant term.

Nevertheless, as it may be observed on Table 3, BF3 demonstrates that it induces to reduce lis, in case productivity is greater than 82.88. Moreover, lis in the non-farm sector is further affected by increasing productivity adversely. BF4 displays that it affects lis positively, if gross government investment is smaller than 174.49 billion dollars. BF6 and BF8 indicate that the effect on lis is a negative one, if unemployment rate is greater than 3.73 or 5.13, while BF5 and BF7 present that the effect on lis is a positive one, if it is greater than 3.4 or less than 5.13. Furthermore, in

BF9, it may be observed that the effect on lis is negative in the case consumer price index is smaller than 35. BF10 expresses that the variable impresses lis positively, if profit is less than 77.49 billion dollars, while BF11 presents that it impresses lis if the value is greater than 77.49 billion dollars. The cross-correlations are found to be very small.

Significance levels of the variables of the model regarding lis in non-farm sector in the US are presented on Table 6. The most effective variable in non-factor business sector regarding lis is determined to be productivity. It is also observed that lis is also affected by current account balance, gross private domestic investment, export, consumer price index, gross domestic product, profit, unemployment rate, and gross government investment, respectively.

Table 6. The significance levels of independent variables for the non-farm sector

Variables	GCV	RSS
prod	100	100
Ca	31.3	31.7
gpdi	28.4	28.4
Exp	28.4	28.4
Cpi	27.5	27.6
Gdp	25.1	25.2
prof	25.8>	25.8>
unemp	20.2	20
Ggi	10.5	11.3

Note: GCV: Generalized cross validation, RSS: Residual sums of squares.

In the last section of the study, lis in non-finance is taken into consideration and the results are presented on Table 7. The model is determined to be statistically significant as the F test rejects the null hypothesis for 1 percent. The Pearson correlation coefficient is also found to be very high, which means that lis is highly associated with independent variables of the model.

Table 7. Results of the best model for the non-finance sector

	Basis Functions	Coefficients
CT	-	76.65
BF1	$\max(0, \text{prod}-55.483)$	1.67
BF2	$\max(0, 78.503-\text{prod})$	0.77
BF3	$\max(0, \text{prod}-78.503)$	-2.05
BF4	$\max(0, 8362.66-\text{gdp})$	0.00
BF5	$\max(0, \text{prof}-387.879)$	-0.01
BF6	$\max(0, 78.503-\text{prod}) * \max(0, \text{ggi}-70.959)$	-0.01
BF7	$\max(0, 78.503-\text{prod}) * \max(0, 70.959-\text{ggi})$	0.00
BF8	$\max(0, 78.503-\text{prod}) * \max(0, \text{ggi}-85.526)$	0.01
BF9	$\max(0, \text{prod}-55.483) * \max(0, 5.83-\text{unemp})$	0.02
BF10	$\max(0, 78.503-\text{prod}) * \max(0, \text{imp}-58651)$	0.00
BF11	$\max(0, 78.503-\text{prod}) * \max(0, 58651-\text{imp})$	0.00
BF12	$\max(0, \text{prod}-78.503) * \max(0, \text{prof}-1158.33)$	0.00
BF13	$\max(0, \text{prod}-78.503) * \max(0, 1158.33-\text{prof})$	0.00
BF14	$\max(0, 8362.66-\text{gdp}) * \max(0, \text{unemp}-4.03333)$	0.00
BF15	$\max(0, 8362.66-\text{gdp}) * \max(0, 4.03-\text{unemp})$	0.00
BF16	$\max(0, 8362.66-\text{gdp}) * \max(0, \text{cpi}-79.0333)$	0.00
BF17	$\max(0, 8362.66-\text{gdp}) * \max(0, 79.0333-\text{cpi})$	0.00
BF18	$\max(0, 8362.66-\text{gdp}) * \max(0, \text{cpi}-92.2667)$	0.00
BF19	$\max(0, 8362.66-\text{gdp}) * \max(0, \text{prof}-74.271)$	0.00
BF20	$\max(0, 8362.66-\text{gdp}) * \max(0, 74.271-\text{prof})$	0.00
BF21	$\max(0, \text{gdp}-8362.66) * \max(0, \text{tax}-1471.73)$	0.00
BF22	$\max(0, \text{gdp}-8362.66) * \max(0, 1471.73-\text{tax})$	0.00
F test		451*** (0.000)
R ²		0.974
Pearson Correlation Coefficient		0.987*** (0.000)

Note: All variables are significant for 1 percent. BF: Basis function. CT: Constant term.

BF1 and BF2 state that lis is affected positively when productivity is greater than 55.483 and is smaller than 78.503. However, in accordance with BF3, if productivity is more than 78.503, it impresses lis negatively. In BF5, when profit is greater than 387.879 billion dollars, lis is affected negatively.

Significance levels of effective variables regarding lis in the non-finance sector in the US are represented on Table 8. The most important variable in the model is determined to be profit concerning lis in the non-finance factor. Moreover, it is also observed that lis is affected by productivity,

import, gross domestic product, tax, gross government investment, consumer price index, and unemployment rate, respectively.

Table 8. The significance levels of independent variables for the non-finance sector

Variables	GCV	RSS
prof	100	100
prod	47.7	48.1
imp	47.7	48.1
gdp	43.4	43.6
tax	36.1	36.1
ggi	26.7	26.6
cpi	25.7	25.4
unemp	18.5	18.4

Note: GCV: Generalized cross validation, RSS: Residual sums of squares.

4. Conclusion and Discussion

The macroeconomic drivers of lis at sectoral level in the US is tried to be determined in this study. The dataset of the study, where MARS approach is employed as a model, comprises the period of 1948Q1-2019Q1.

In accordance with the results of the study, the most significant predictors of lis in business sector are determined to be productivity, export, profit, gross private domestic investment, unemployment rate, current account balance, gross domestic product, and tax revenue, respectively.

Concerning the non-farm sector, the most effective variable regarding lis in business sector is found to be productivity. Furthermore, it is also observed in the study that lis is affected by current account balance, gross private domestic investment, export, consumer price index, gross domestic product, profit, unemployment rate, and gross government investment, respectively.

With regards to the non-finance sector, while the most significant variable in the model is defined to be profit concerning lis, whereas it is also determined that lis is also affected by productivity, import, gross domestic product, tax, gross government investment, consumer price index, and unemployment rate, respectively.

In addition to the findings listed above, it is concluded that productivity, which is observed to be the most prominent macroeconomic dynamic, affects lis negatively. It may also be declared that the result is consistent

with the studies of Bentolila and Saint-Paul (2003)³⁷, Guscina (2006)³⁸, Jayadev (2007)³⁹, Kristal (2010)⁴⁰, Hogrefe and Kappler (2013)⁴¹, Bassanini and Manfredi (2014)⁴², Young and Lawson (2014)⁴³, Bengtsson (2014)⁴⁴, and Perugini et al. (2017)⁴⁵.

Moreover, it is also detected that when productivity is greater than 82.88 in business and non-farm sectors, it is observed that the negative effect of productivity on lis is more profound in non-farm sector. However, this impact is seen only in the slightest sense in the business sector. Therefore, these findings produce evidence that employees could not afford their productivity in all sectors.

Consequently, it may be argued that lis has been in decline in the US for a long time, whereas this decline has become critical since the early 2000s. In respect of this, macroeconomic dynamics of lis in the US are determined in accordance with the objective of the study. As a result of the analyses, the most prominent dynamics are determined as productivity, gross domestic product and unemployment regarding lis of three sectors stated above. The results also demonstrate that the dynamics of sectors are different in terms of lis in the US and therefore, such sectorial differences shall be taken into consideration in policy response. The obtained findings in this study could guide in determining wage levels

³⁷ S. Bentolila, G. Saint-Paul, *Explaining Movements in the Labor Share*, in *Contributions in Macroeconomics*, 2003, vol. 3, n. 1.

³⁸ A. Guscina, *Effects of Globalization on Labor's Share in National Income*, International Monetary Fund, Working Paper No. 06/294, 2006, <https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Effects-of-Globalization-on-Labors-Share-in-National-Income-19244> (accessed July 15, 2019)

³⁹ A. Jayadev, *Capital Account Openness and the Labour Share of Income*, in *Cambridge Journal of Economics*, 2007, vol. 31, n. 3, 423-443.

⁴⁰ T. Kristal, *Good Times, Bad Times: Postwar Labor's Share of National Income in Capitalist Democracies*, in *American Sociological Review*, 2010, vol. 75, n. 5, 729-763.

⁴¹ J. Hogrefe, M. Kappler, *The Labour Share of Income: Heterogeneous Causes for Parallel Movements?*, in *The Journal of Economic Inequality*, 2013, vol. 11, n. 3, 303-319.

⁴² A. Bassanini, T. Manfredi, *Capital's Grabbing Hand? A Cross-Country/Cross-Industry Analysis of the Decline of the Labour Share*, OECD, Working Paper No. 133, 2012, <https://www.oecd-ilibrary.org/docserver/5k95zqsf4bxt-en.pdf?expires=1590182407&id=id&accname=guest&checksum=CC8C9F00F05B065B49F8E6B675516ACE> (accessed July 15, 2019).

⁴³ A.T. Young, R.A. Lawson, *Capitalism and Labor Shares: A Cross-Country Panel Study*, in *European Journal of Political Economy*, 2014, vol. 33, 20-36.

⁴⁴ E. Bengtsson, *Do Unions Redistribute Income from Capital to Labour? Union Density and Wage Shares since 1960*, in *Industrial Relations Journal*, 2014, vol. 45, n. 5, 389-408.

⁴⁵ C. Perugini, M. Vecchi, F. Venturini, *Globalisation and the Decline of the Labour Share: A Microeconomic Perspective*, in *Economic Systems*, 2017, vol. 41, n. 4, 524-536.

in the US. Finally, it may be declared that further studies would add new factors and enhance the model.

Appendix 1. The definition of variables

Type	Variables	Abridgment	Unit	Resource
Dep. Var.	LIS of Business Sector	Bus_lis	Index 2012=100	FRED
	LIS of Non-farm Sector	Nonfarm_lis	Index 2012=100	FRED
	LIS of Non-Finance Sector	Nonfin_lis	Index 2012=100	FRED
Indep. Var.	Current Account Balance	ca	NIPA's, Billions of Dollars	FRED
	Productivity (Business Sector: Real Output Per Hour of All Persons)	prod	Index 2012=100	FRED
	Gross Domestic Product	gdp	Billions of Dollars	FRED
	Gross Private Domestic Investment	gpdi	Billions of Dollars	FRED
	Gross Government Investment	ggi	Billions of Dollars	FRED
	Unemployment Rate	unemp	Percent (Monthly)	BLS
	Consumer Price Index	cpi	All items in the US city average, all urban consumers	BLS
	Export (Goods and Services)	exp	Billions of Dollars	FRED
	Import (Goods and Services)	imp	Billions of Dollars	FRED
	Profits before tax (Corporate business)	prof	Billions of Dollars	FRED
	Tax (Federal government current tax receipts)	tax	Billions of Dollars	FRED

Note: LIS: Labour Income Share, FRED: Federal Reserve Data, BLS: Bureau of Labor Statistics, Dep. Var.: Dependent Variables, Indep. Var.: Independent Variables.

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