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Article

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The Dependence of Net Average Wage on Labour Productivity in Romania

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Abstract: The paper studies the net average wage dependence of each part of national economy in terms of labor productivity.

Keywords: wage; productivity

JEL Classification: E24

1. Introduction

In this research we aim to analyze the economic performance of Romania from the perspective of the average cost of labor and productivity in the period 1995-2018.

It is analyzed the interdependence between the dynamics of the average wage and the dynamics of labor productivity on each sector of economic activity at national level: Agriculture, hunting, forestry, fishing and fish farming, Extractive industry, Manufacturing industry, Electricity and heat, gas and water, Construction, Trade, Hotels and restaurants, Transport, storage and communications, Financial intermediation, Real estate transactions and other services, Public administration and defense, Education, Health and social assistance, Other activities of the national economy.

An essential condition for the competitiveness of an economy both internally and externally is the interdependence between the dynamics of average wages and labor productivity, interdependence that exists both at the microeconomic and macroeconomic levels. Moreover, the interdependence between labor productivity and labor factor compensation is also of particular importance for the employee because his standard of living essentially depends on this.

During the analyzed period, Romania's economy registered periods of transition, of economic crisis, and as such, the labor productivity was not the only determining factor of the average price of the labor factor. The economic conditions that a national economy faces can also influence wages throughout the economic cycle. Although the period of the economic crisis (2008-2010) is not analyzed separately (because it is not the object of this scientific approach) we must remember the above-mentioned period, as well as the previous economic situation, in which most world economies and Romania also, recorded rates of economic growth above potential, which generated growth rates higher than the dynamics of labor productivity.

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According to the microeconomic theory, the unit price of the labor factor is equal to the physical marginal product of the labor factor, multiplied by the price of the final product.

In a perfectly competitive market, where the company cannot control or influence the price, it employs units of labor factors as long as the marginal income of labor exceeds the price. In other words, the company continues to purchase additional production factor until the last unit purchased will increase the total income by the same amount as it will increase the cost, in other words the marginal income of the production factor will equal the marginal cost of the production factor.

In the literature, the interdependence between these two variables has generated over time various theoretical debates that have focused not only on economic importance but also on technical issues such as difficulties in measurement for comparison. In the production process, we must also assign a qualitative dimension to the labor factor, not only a quantitative one, that is why it is more difficult to capture in statistical analyzes the quality and efficiency of human capital.

2. The Primary Data Analysis

The first part of the analysis will study the evolution of the net salary by activities of the national economy, the data source being the National Institute of Statistics of Romania. Due to the regrouping, in the last years, of the data regarding the branches of the national economy, we have made weighted averages regarding the average wage.

Table 1. Monthly average net nominal nominal earnings per activity of the national economy – part 1

Year	Total	Agriculture, hunting, forestry, fishing and fish farming	Extractive industry	Manufacturing industry	Electricity and heat, gas and water
1995	211373	171328	335917	207942	317502
1996	321169	254598	487360	323337	471698
1997	632086	471532	975494	628815	1055735
1998	1042274	767875	1679799	967713	1835405
1999	1522878	1168527	2364368	1388580	2396737
2000	2139138	1538239	3676379	1968253	3406634

Data source: insse.ro

The values for the period 1995-2004 are not denominated, for the period 2005-2018 the conversion being from 1 to 10000

Table 2. Monthly average net nominal nominal earnings per activity of the national economy – part 2

Year	Construction	Trade	Hotels and restaurants	Transport, storage and communications	Financial intermediation
1995	224855	168777	145403	255562	389521
1996	332082	250282	216496	395549	659092
1997	617101	459497	412334	799065	1482926
1998	986083	717877	663357	1318573	2763051
1999	1399927	1066958	941455	1976860	3995188
2000	1861422	1502294	1381068	2811942	5258061
2001	2620690	2218504	2109541	4050363	7418638
2002	3257856	2705850	2434081	5230115	9950653
2003	4236699	3639758	3260266	6618419	12464690
2004	5256697	4386558	4110215	7827833	15624873
2005	628	575	455	934	2065
2006	710	651	534	1036	2260
2007	881	823	651	1223	2617
2008	1162	1042	773	1612	3205
2009	1069	1047	799	1736	3109
2010	1125	1166	786	1828	3200
2011	1247	1227	841	1910	3435
2012	1193	1305	850	1973	3587
2013	1191	1293	898	2006	3645
2014	1240	1412	958	2173	3708
2015	1422	1588	1080	2457	4004
2016	1525	1736	1232	2738	4061
2017	1695	2017	1424	3004	4310
2018	1924	2228	1565	3299	4532

Data source: insse. ro

The values for the period 1995-2004 are not denominated, for the period 2005-2018 the conversion being from 1 to 10000

Table 3. Monthly Average Net Nominal Nominal Earnings per Activity of the National Economy – Part 3

Year	Real estate transactions and other services	Public administration and defense	Education	Health and social assistance	Other activities of the national economy
1995	226271	225914	194772	161252	155885
1996	340445	304649	275597	229743	253358
1997	681983	608716	539919	463440	522895
1998	1062108	1373164	1051738	850351	864561
1999	1520096	2143292	1415535	1506768	1326901
2000	2159136	3044988	2046107	1768105	1899075
2001	2992819	4194757	2882399	2624161	2590811
2002	3816358	5115510	3801292	3194582	3430037
2003	4685301	6922734	4768977	4126723	4278952
2004	5850682	8451531	6481023	5206553	5375123
2005	720	1163	829	676	667
2006	831	1575	1067	823	743

2007	1106	1997	1175	948	883
2008	1235	2411	1538	1266	922
2009	1300	2159	1596	1342	957
2010	1348	1968	1380	1226	907
2011	1408	1909	1316	1210	922
2012	1477	2102	1371	1315	988
2013	1582	2420	1533	1456	1060
2014	1691	2754	1733	1496	1176
2015	1904	2893	1886	1656	1326
2016	2119	3084	2035	2065	1454
2017	2313	3842	2387	2672	1709
2018	2580	4407	2821	3388	1929

Data source: insse.ro

The values for the period 1995-2004 are not denominated, for the period 2005-2018 the conversion being from 1 to 10000

On the other hand, between 1995 and 2018, the cumulative CPI (relative to the reference year 2000) was:

Table 4. The Cumulative CPI (Relative to the Reference Year 2000)

Year	Cumulative CPI	Year	Cumulative CPI	Year	Cumulative CPI
1995	0. 082787	**2003**	1. 75136	**2011**	2. 880364
1996	0. 129893	**2004**	1. 914236	**2012**	3. 022942
1997	0. 32655	**2005**	2. 07886	**2013**	3. 069798
1998	0. 459129	**2006**	2. 180101	**2014**	3. 095277
1999	0. 710732	**2007**	2. 323334	**2015**	3. 066491
2000	1	**2008**	2. 469704	**2016**	3. 049932
2001	1. 303	**2009**	2. 586768	**2017**	3. 15119
2002	1. 534934	**2010**	2. 792674	**2018**	3. 254234

Data source: insse. ro and own calculations

Denominating the data in tables 1-3 and deflating at the level of 2000, we have:

Table 5. Monthly Average Net Nominal Nominal Earnings per Activity of the National Economy (Lei 2000) – Part 1

Year	Total	Agriculture, hunting, forestry, fishing and fish farming	Extractive industry	Manufacturing industry	Electricity and heat, gas and water
1995	254	205	411	254	387
1996	246	192	377	246	362
1997	193	144	300	193	325
1998	227	168	366	211	401
1999	214	165	332	196	338
2000	214	154	368	197	341
2001	232	166	402	210	371
2002	247	179	436	221	382
2003	276	197	468	249	429
2004	313	234	509	284	471

2005	359	237	599	314	566
2006	397	272	695	335	618
2007	448	309	776	374	679
2008	530	370	926	425	663
2009	526	389	912	443	665
2010	498	367	872	443	638
2011	501	362	895	460	647
2012	499	362	922	461	639
2013	514	384	959	478	624
2014	548	410	1053	510	650
2015	606	447	1126	556	662
2016	671	531	1118	617	714
2017	742	590	1164	668	760
2018	812	657	1164	720	824

Table 6. Monthly Average Net Nominal Nominal Earnings per Activity of the National Economy (Lei 2000) – Part 2

Year	Construction	Trade	Hotels and restaurants	Transport, storage and communications	Financial intermediation
1995	266	205	181	314	471
1996	254	192	169	308	508
1997	190	141	126	245	453
1998	216	157	144	288	601
1999	197	151	132	279	563
2000	186	150	138	281	526
2001	201	170	162	311	569
2002	212	177	158	341	648
2003	242	208	186	378	711
2004	275	229	215	409	816
2005	302	277	219	449	993
2006	326	299	245	475	1037
2007	379	354	280	526	1126
2008	471	422	313	653	1298
2009	413	405	309	671	1202
2010	403	418	281	655	1146
2011	433	426	292	663	1193
2012	395	432	281	653	1187
2013	388	421	293	653	1187
2014	401	456	310	702	1198
2015	464	518	352	801	1306
2016	500	569	404	898	1332
2017	538	640	452	953	1368
2018	591	685	481	1014	1393

Table 7. Monthly Average Net Nominal Nominal Earnings per Activity of the National Economy (Lei 2000) – Part 3

Year	Real estate transactions and other services	Public administration and defense	Education	Health and social assistance	Other activities of the national economy
1995	278	278	230	193	193
1996	262	231	216	177	192
1997	208	187	165	141	159
1998	231	298	229	185	187
1999	214	301	200	212	187
2000	216	304	205	177	190
2001	229	322	221	201	199
2002	249	334	248	208	223
2003	268	395	272	236	244
2004	306	441	339	272	281
2005	346	559	399	325	321
2006	381	722	489	378	341
2007	476	860	506	408	380
2008	500	976	623	513	373
2009	503	835	617	519	370
2010	483	705	494	439	325
2011	489	663	457	420	320
2012	489	695	454	435	327
2013	515	788	499	474	345
2014	546	890	560	483	380
2015	621	943	615	540	432
2016	695	1011	667	677	477
2017	734	1219	757	848	542
2018	793	1354	867	1041	593

The second part of the analysis will study the evolution of labor productivity by activities of the national economy, the data source being also the National Institute of Statistics of Romania. Due to the regrouping, in the last years, of the data regarding the branches of the national economy, we extrapolated the data to the related branches.

Table 8. Labor Productivity by Activities of the National Economy – Part 1

Year	Total	Agriculture, hunting, forestry, fishing and fish farming	Extractive industry	Manufacturing industry	Electricity and heat, gas and water
1995	621. 2	280. 4	780. 9	780. 9	780. 9
1996	964. 6	434. 1	1215. 8	1215. 8	1215. 8
1997	2104. 7	947. 7	2632. 1	2632. 1	2632. 1
1998	3036. 8	1118. 1	3710. 8	3710. 8	3710. 8
1999	4552. 1	1435. 9	5546. 8	5546. 8	5546. 8
2000	6779. 6	1815	8562. 4	8562. 4	8562. 4
2001	9993. 3	3267. 7	13370. 6	13370. 6	13370. 6
2002	14365. 5	5068. 8	16599. 7	16599. 7	16599. 7
2003	17893. 5	6467. 5	20546. 8	20546. 8	20546. 8
2004	23889. 9	10066. 3	27066. 6	27066. 6	27066. 6

2005	27774. 5	7829. 5	33092. 6	33092. 6	33092. 6
2006	32634. 5	8892. 9	38540. 6	38540. 6	38540. 6
2007	39987. 6	7794. 5	47683. 6	47683. 6	47683. 6
2008	51740. 8	11697. 5	65214. 3	65214. 3	65214. 3
2009	53530. 8	11505. 8	71318. 8	71318. 8	71318. 8
2010	54027. 9	9360. 9	89068. 8	89068. 8	89068. 8
2011	57691. 4	13596. 5	101461. 6	101461. 6	101461. 6
2012	60334. 4	10475. 9	84137. 7	84137. 7	84137. 7
2013	65409. 5	13187. 2	90555. 7	90555. 7	90555. 7
2014	68537. 9	12485. 2	92346. 2	92346. 2	92346. 2
2015	73481. 5	13250	96221. 6	96221. 6	96221. 6
2016	81424. 1	15465. 4	100228	100228	100228
2017	89980. 8	18356. 8	107780	107780	107780
2018	99494. 6	20973. 6	113821. 9	113821. 9	113821. 9

Data source: insse.ro

Table 9. Labor Productivity by Activities of the National Economy – Part 2

Year	Construction	Trade	Hotels and restaurants	Transport, storage and communications	Financial intermediation
1995	765. 8	732. 7	732. 7	732. 7	5048. 4
1996	1225. 5	1275	1275	1275	5052. 3
1997	2451. 4	2946. 1	2946. 1	2946. 1	7791
1998	3648. 8	4576. 3	4576. 3	4576. 3	13929. 4
1999	5349. 3	6805. 7	6805. 7	6805. 7	22406. 7
2000	7992. 2	9490. 6	9490. 6	9490. 6	35909. 1
2001	12358. 5	12596. 2	12596. 2	12596. 2	47659. 7
2002	17429	15706. 3	15706. 3	15706. 3	44167. 4
2003	22575. 8	21628. 2	21628. 2	21628. 2	41164. 5
2004	32864	29432. 9	29432. 9	29432. 9	68423. 2
2005	39400. 1	36479. 2	36479. 2	36479. 2	72381. 1
2006	48694. 1	41387. 2	41387. 2	41387. 2	70981. 9
2007	59566. 7	49731. 6	49731. 6	49731. 6	89876. 7
2008	83757. 6	56885. 5	56885. 5	56885. 5	108531. 7
2009	82050	58515. 2	58515. 2	58515. 2	95386. 1
2010	64382. 2	38798. 2	38798. 2	38798. 2	102489. 6
2011	56294. 4	30488. 9	30488. 9	30488. 9	118913. 9
2012	69524	58526. 6	58526. 6	58526. 6	144587. 6
2013	70418. 6	53577. 1	53577. 1	53577. 1	218204
2014	65777. 6	58698. 9	58698. 9	58698. 9	217883. 5
2015	66181. 7	67577. 9	67577. 9	67577. 9	223058. 2
2016	68631. 1	73839. 2	73839. 2	73839. 2	239482. 5
2017	63544. 5	83322	83322	83322	184545. 3
2018	77265. 7	87414. 1	87414. 1	87414. 1	215915. 1

Data source: insse. ro

Table 10. Labor Productivity by Activities of the National Economy – Part 3

Year	Real estate transactions and other services	Public administration and defense	Education	Health and social assistance	Other activities of the national economy
1995	14494. 8	517. 5	517. 5	517. 5	496. 2
1996	19976. 9	769. 9	769. 9	769. 9	637
1997	40526. 4	1833. 9	1833. 9	1833. 9	1739. 2
1998	62557. 5	2929. 2	2929. 2	2929. 2	2925. 8
1999	95371. 9	5945. 4	5945. 4	5945. 4	5134. 7
2000	141432	9733. 3	9733. 3	9733. 3	8819
2001	193082. 4	13277	13277	13277	9773. 5
2002	254431. 4	17404. 6	17404. 6	17404. 6	13329
2003	252674. 4	21472. 4	21472. 4	21472. 4	17379
2004	516977. 6	19069. 1	19069. 1	19069. 1	28329. 7
2005	822650. 2	24528	24528	24528	31797. 4
2006	823925. 2	27423. 1	27423. 1	27423. 1	41516
2007	1098839	31650. 6	31650. 6	31650. 6	49875
2008	1152582	42612. 9	42612. 9	42612. 9	63057. 2
2009	1510202. 8	39652. 3	39652. 3	39652. 3	78662. 8
2010	1656363	56791. 6	56791. 6	56791. 6	76745. 1
2011	1697060. 2	51569. 9	51569. 9	51569. 9	96200. 9
2012	1918197. 6	58043. 3	58043. 3	58043. 3	83594. 2
2013	2002011. 9	62309. 6	62309. 6	62309. 6	74960. 5
2014	1822563. 8	73339. 6	73339. 6	73339. 6	80689. 9
2015	1905849. 1	60150. 2	60150. 2	60150. 2	96205. 5
2016	2243946. 4	75366. 7	75366. 7	75366. 7	90941. 3
2017	2993887	89255. 5	89255. 5	89255. 5	108984. 5
2018	2783578. 1	108936. 3	108936. 3	108936. 3	128630. 8

Data source: insse.ro

Denominating the data in tables 8-10 and deflating at the level of 2000, we obtain (dividing at 12 months for further comparability):

Table 11. Monthly Labor Productivity by Activities of the National Economy (Lei 2000) – Part 1

Year	Total	Agriculture, hunting, forestry, fishing and fish farming	Extractive industry	Manufacturing industry	Electricity and heat, gas and water
1995	625	282	786	786	786
1996	619	279	780	780	780
1997	537	242	672	672	672
1998	551	203	674	674	674
1999	534	168	650	650	650
2000	565	151	714	714	714
2001	639	209	855	855	855
2002	780	275	901	901	901
2003	851	308	978	978	978
2004	1040	438	1178	1178	1178

2005	1113	314	1327	1327	1327
2006	1247	340	1473	1473	1473
2007	1434	280	1710	1710	1710
2008	1746	395	2201	2201	2201
2009	1725	371	2298	2298	2298
2010	1612	279	2658	2658	2658
2011	1669	393	2935	2935	2935
2012	1663	289	2319	2319	2319
2013	1776	358	2458	2458	2458
2014	1845	336	2486	2486	2486
2015	1997	360	2615	2615	2615
2016	2225	423	2739	2739	2739
2017	2380	485	2850	2850	2850
2018	2548	537	2915	2915	2915

Table 12. Monthly Labor Productivity by Activities of the National Economy (Lei 2000) – Part 2

Year	Construction	Trade	Hotels and restaurants	Transport, storage and communications	Financial intermediation
1995	771	738	738	738	5082
1996	786	818	818	818	3241
1997	626	752	752	752	1988
1998	662	831	831	831	2528
1999	627	798	798	798	2627
2000	666	791	791	791	2992
2001	790	806	806	806	3048
2002	946	853	853	853	2398
2003	1074	1029	1029	1029	1959
2004	1431	1281	1281	1281	2979
2005	1579	1462	1462	1462	2902
2006	1861	1582	1582	1582	2713
2007	2137	1784	1784	1784	3224
2008	2826	1919	1919	1919	3662
2009	2643	1885	1885	1885	3073
2010	1921	1158	1158	1158	3058
2011	1629	882	882	882	3440
2012	1917	1613	1613	1613	3986
2013	1912	1454	1454	1454	5923
2014	1771	1580	1580	1580	5866
2015	1799	1837	1837	1837	6062
2016	1875	2018	2018	2018	6543
2017	1680	2203	2203	2203	4880
2018	1979	2239	2239	2239	5529

Table 13. Monthly Labor Productivity by Activities of the National Economy (Lei 2000) – Part 3

Year	Real estate transactions and other services	Public administration and defense	Education	Health and social assistance	Other activities of the national economy
1995	14591	521	521	521	500
1996	12816	494	494	494	409
1997	10342	468	468	468	444
1998	11354	532	532	532	531
1999	11182	697	697	697	602
2000	11786	811	811	811	735
2001	12349	849	849	849	625
2002	13813	945	945	945	724
2003	12023	1022	1022	1022	827
2004	22506	830	830	830	1233
2005	32977	983	983	983	1275
2006	31494	1048	1048	1048	1587
2007	39413	1135	1135	1135	1789
2008	38891	1438	1438	1438	2128
2009	48652	1277	1277	1277	2534
2010	49426	1695	1695	1695	2290
2011	49099	1492	1492	1492	2783
2012	52879	1600	1600	1600	2304
2013	54347	1692	1692	1692	2035
2014	49068	1975	1975	1975	2172
2015	51792	1635	1635	1635	2614
2016	61311	2059	2059	2059	2485
2017	79173	2360	2360	2360	2882
2018	71281	2790	2790	2790	3294

3. The Analysis of Total Data

By the tables 5 and 11 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

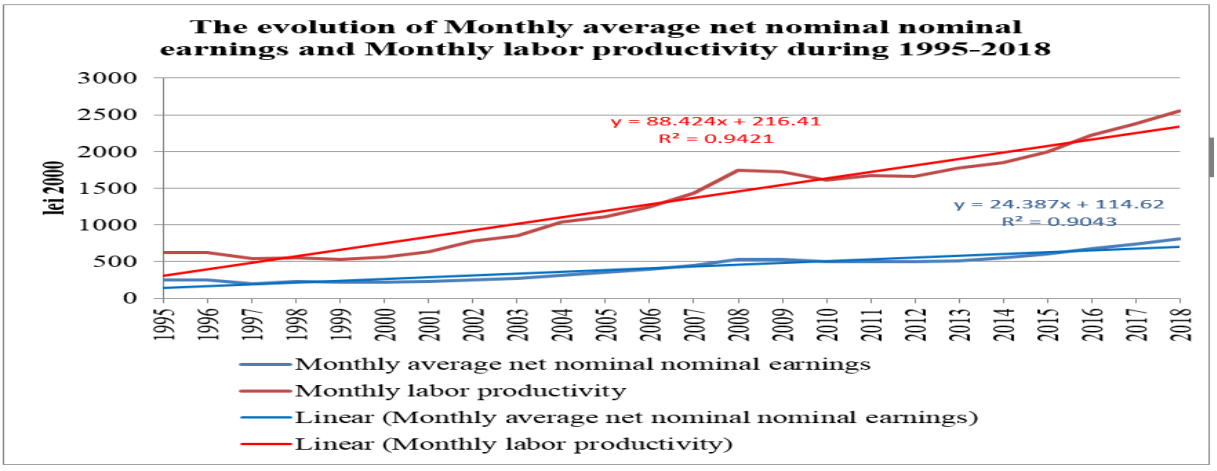

Figure 1.

From figure 1, it can be seen that, at a general level, the evolution of labor productivity experienced a trend of 3. 62 times higher than that of the average net wage. This gap is explained by the massive reinvestment of the profit in technology and re-technology as well as in the modernization of production capacities.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows an inconsistent evolution, especially with regard to the latter.

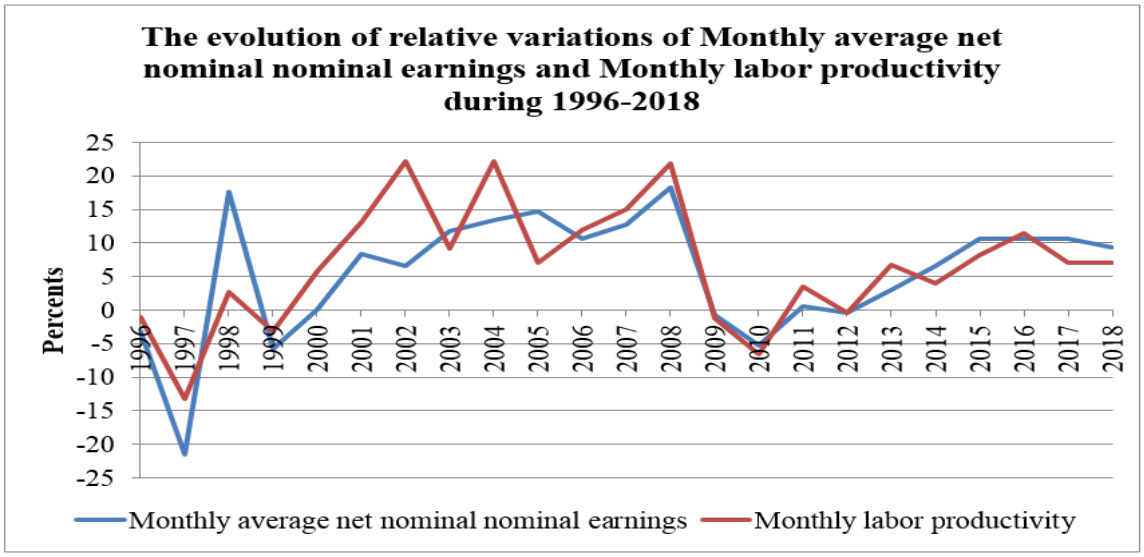

Figure 2.

Between 1996 and 1998, highest fluctuations in both indicators were recorded. Due to the beginning of the structural transformations of the economy, both the labor productivity and the average wage decreased massively in 1997. In 1998, due to trade union pressures, the average wage increased by 17. 6% while the labor productivity with only 2. 6% which led at an inflationary peak of 54. 8% in 1999. If, after this period, the labor productivity curve has generally been well above the average wage, starting with 2006 they have gone somewhat in parallel.

In what follows we will note:

- W - Monthly average net nominal nominal earnings;
- LP - Labor productivity

The analysis of the dependence of the average net wage on labor productivity reveals a high dependence (with R^2=0. 988), which means that the regression relation:

W=0. 279873731·LP+49. 54689062

shows, in a percentage of 98. 8% the dependence of the average net wage of productivity.

Table 14.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 994191858
R Square	0. 988417451
Adjusted R Square	0. 987890971
Standard Error	19. 95507116
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	747593. 4513	747593. 4513	1877. 409136	8. 51058E-23
Residual	22	8760. 507028	398. 2048649		
Total	23	756353. 9583			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	49. 54689062	9. 459207614	5. 237953604	2. 96671E-05	29. 9296947	69. 16408653
X Variable 1	0. 279873731	0. 006459259	43. 32907956	8. 51058E-23	0. 266478049	0. 293269414

4. The Analysis of Agriculture, Hunting, Forestry, Fishing and Fish Farming

By the tables 5 and 11 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

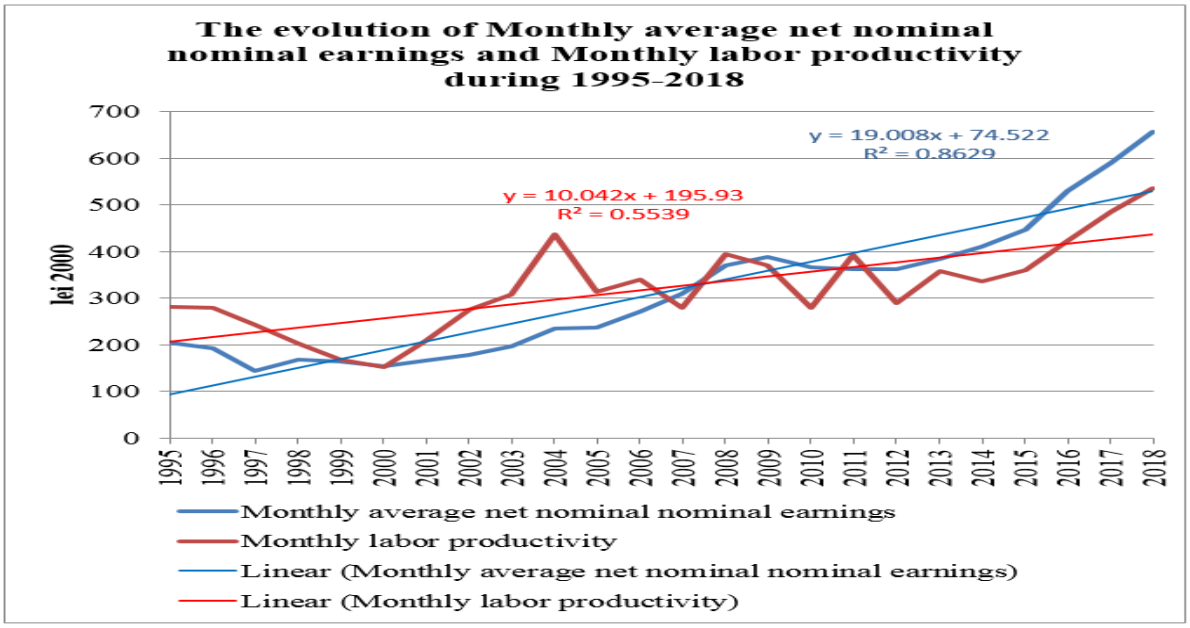

Figure 3.

From figure 3, it can be seen that, at a general level, the evolution of labor productivity regarding Agriculture, hunting, forestry, fishing and fish farming has experienced two great periods. During 1995-2008 it was well above the average net salary, re-technologization, especially of agriculture being absolutely necessary to increase competitiveness especially at export. After 2009, we notice an almost constant gap in favor of the net salary. On the other hand, the close values of the two indicators are a worrying factor, showing that practically all the profits of the companies go in the salary direction which will lead, in the future, to serious malfunctions.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows an inconsistent evolution, especially with regard to the latter.

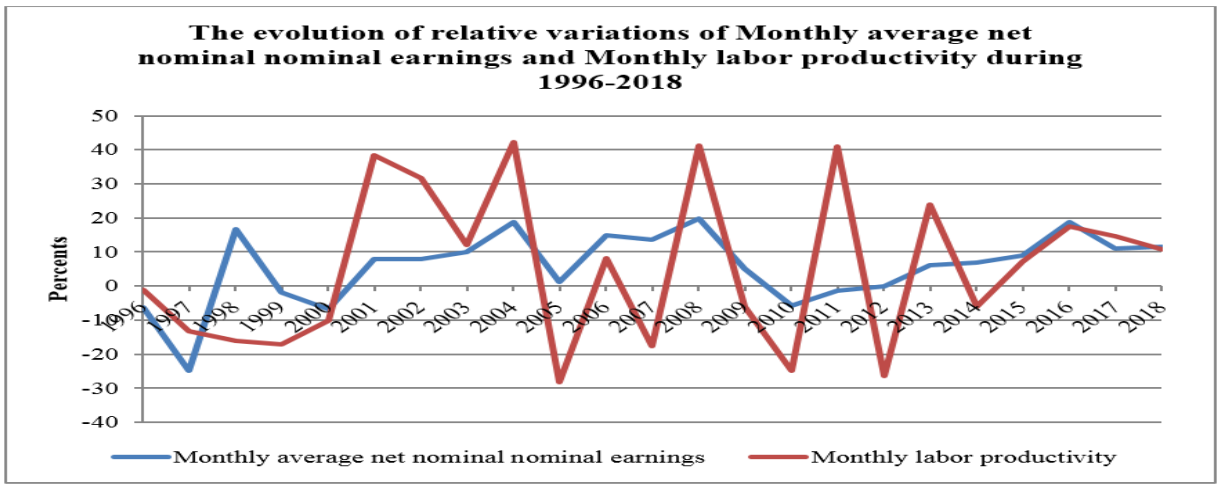

Figure 4.

Between 1996 and 2000, the relative evolution of productivity was negative, due to the beginning of the structural transformations of the economy. After a relatively stable period (2000-2004), we can see a somewhat chaotic period in the variation of labor productivity. If any increase is registered in one year, immediately in the following year it is at (relative) negative levels of concern. It is very possible that this is also due to the poor irrigation systems in agriculture, the alternation of the dry years with the rainy ones creating serious malfunctions.

The analysis of the dependence of the average net wage on labor productivity reveals a moderate dependence (with R^2=0. 687), which means that the regression relation:

W=1. 257198218·LP-92. 01184398

shows, in a percentage of 68. 7% the dependence of the average net wage of productivity.

Table 15.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 829013168
R Square	0. 687262833
Adjusted R Square	0. 673047507
Standard Error	82. 73520835
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	330938. 1016	330938. 1016	48. 34661157	5. 57575E-07
Residual	22	150592. 5234	6845. 1147		
Total	23	481530. 625			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 85. 0%*	*Upper 85. 0%*
Intercept	-92. 01184398	60. 5264887	-1. 52019134	0. 142705711	-182. 2943416	-1. 7293464
X Variable 1	1. 257198218	0. 180809288	6. 95317277	5. 57575E-07	0. 987499538	1. 526896899

Worrying is the trend 1. 257 that shows an evolution of wages well above that of labor productivity.

5. The Analysis of Extractive Industry

By the tables 5 and 11 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

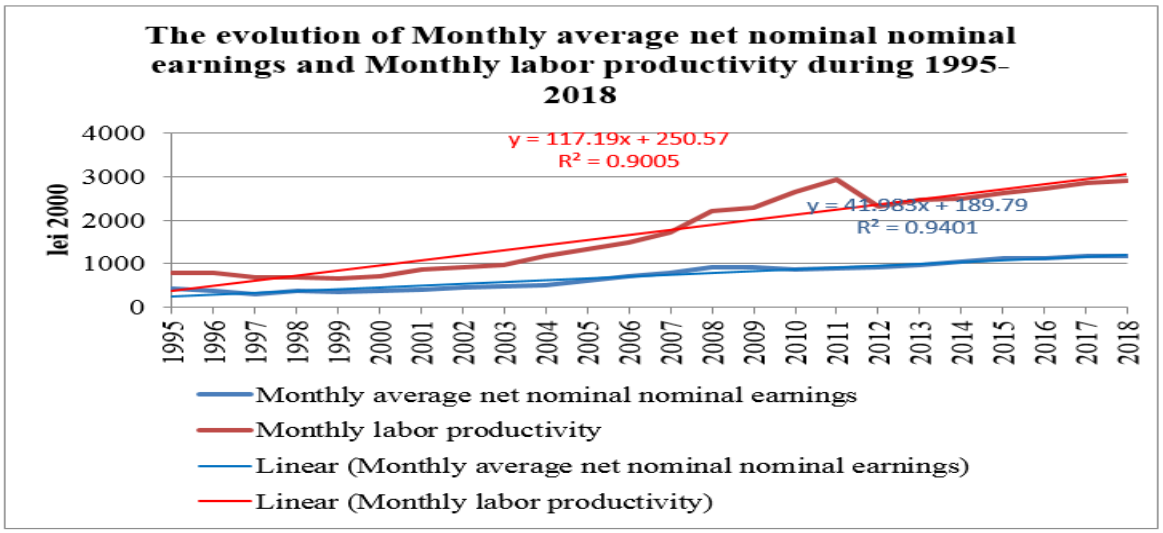

Figure 5.

From figure 5, it can be seen that, at a general level, the evolution of labor productivity regarding Extractive industry has, in general, a trend 2. 79 times higher than that of net wages.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows a parallel evolution, except for a few periods: 2012, 2014, 2016.

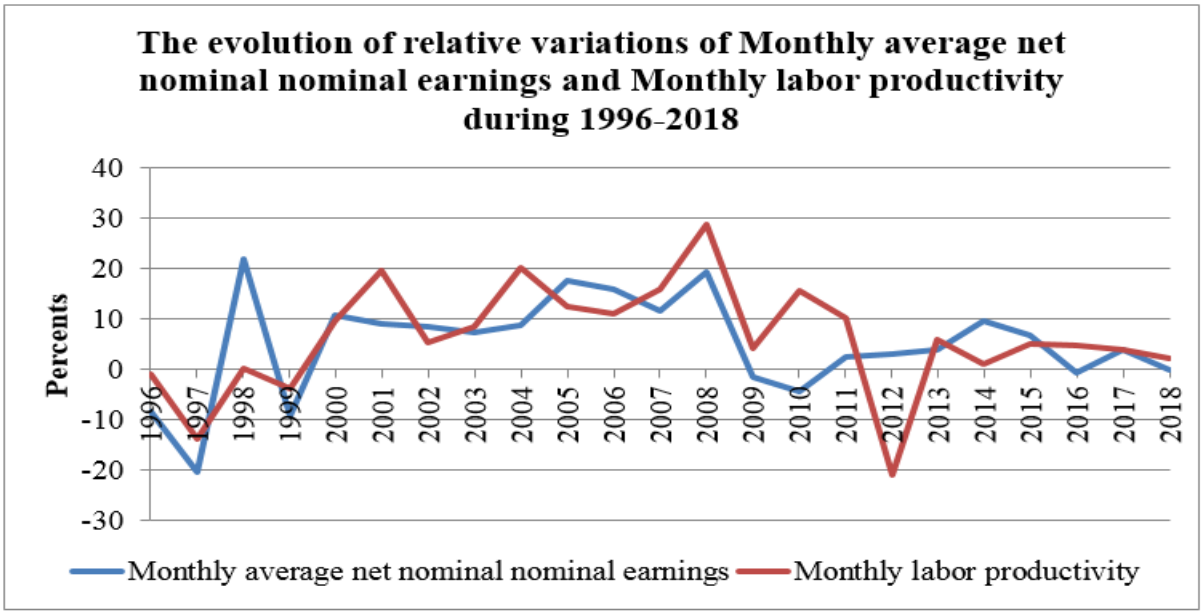

Figure 6.

The analysis of the dependence of the average net wage on labor productivity reveals a higher dependence (with R^2=0. 943), which means that the regression relation:

W=0. 340443783·LP+130. 5520227

shows, in a percentage of 94. 3% the dependence of the average net wage of productivity.

Table 16.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 970995274
R Square	0. 942831821
Adjusted R Square	0. 940233268
Standard Error	74. 85236178
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2032888. 56	2032888. 56	362. 8294713	3. 68286E-15
Residual	22	123263. 2734	5602. 876063		
Total	23	2156151. 833			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	130. 5520227	34. 25702496	3. 810956231	0. 000955343	59. 50730129	201. 5967442
X Variable 1	0. 340443783	0. 017872863	19. 04808314	3. 68286E-15	0. 303377734	0. 377509833

6. The Analysis of Manufacturing Industry

By the tables 5 and 11 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

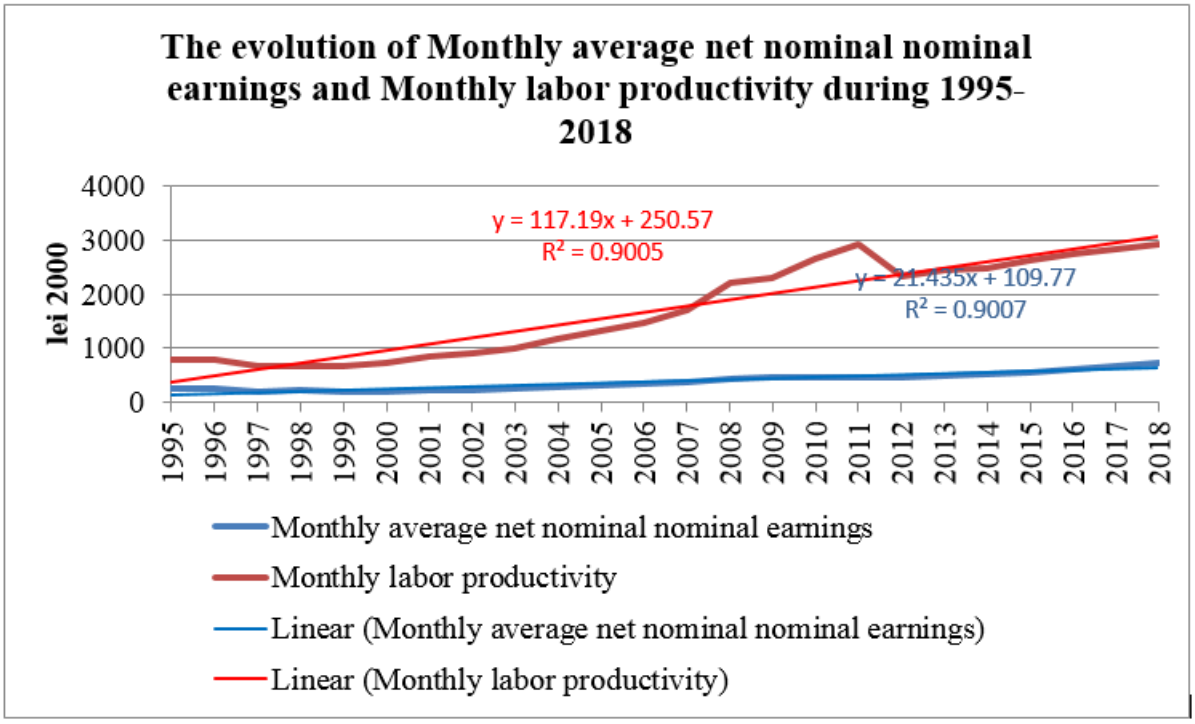

Figure 7.

From figure 7, it can be seen that, at a general level, the evolution of labor productivity regarding Manufacturing industry has, in general, a trend 5. 47 times higher than that of net wages.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows a parallel evolution.

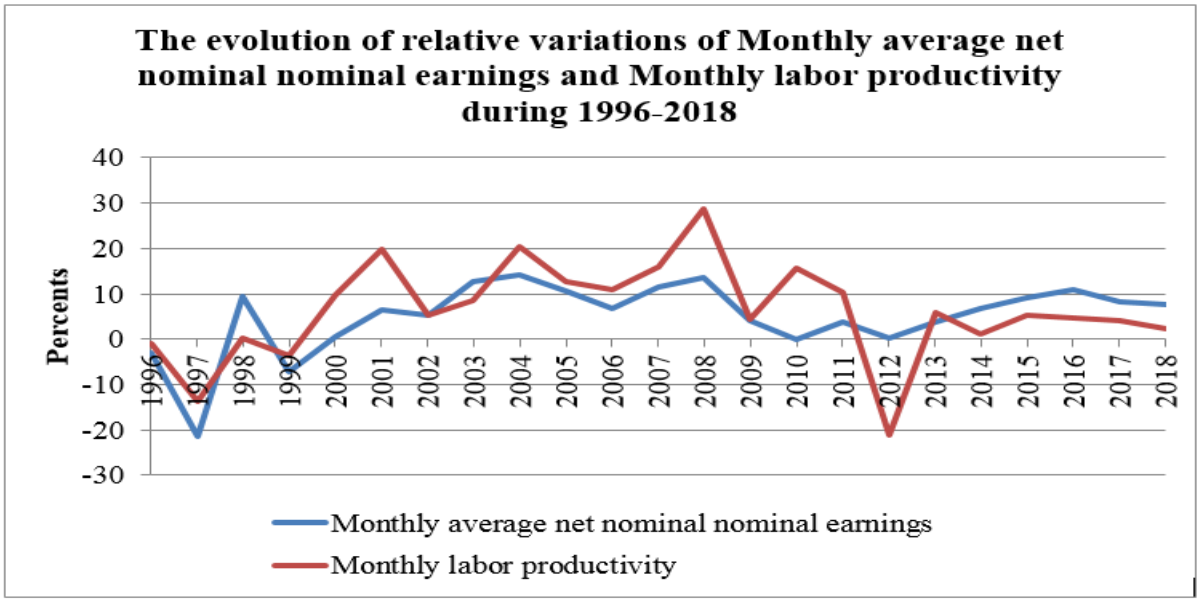

Figure 8.

The analysis of the dependence of the average net wage on labor productivity reveals a higher dependence (with R^2=0. 890), which means that the regression relation:

W=0. 172538718·LP+81. 71816192

shows, in a percentage of 89. 0% the dependence of the average net wage of productivity.

Table 17.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 943408772
R Square	0. 890020111
Adjusted R Square	0. 885021025
Standard Error	54. 1555952
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	522150. 7315	522150. 7315	178. 0365722	5. 05046E-12
Residual	22	64522. 22681	2932. 828492		
Total	23	586672. 9583			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	81. 71816192	24. 78491704	3. 297092413	0. 003284649	30. 31738999	133. 1189339
X Variable 1	0. 172538718	0. 012930995	13. 3430346	5. 05046E-12	0. 145721475	0. 199355961

7. The Analysis of Electricity and Heat, Gas and Water

By the tables 5 and 11 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

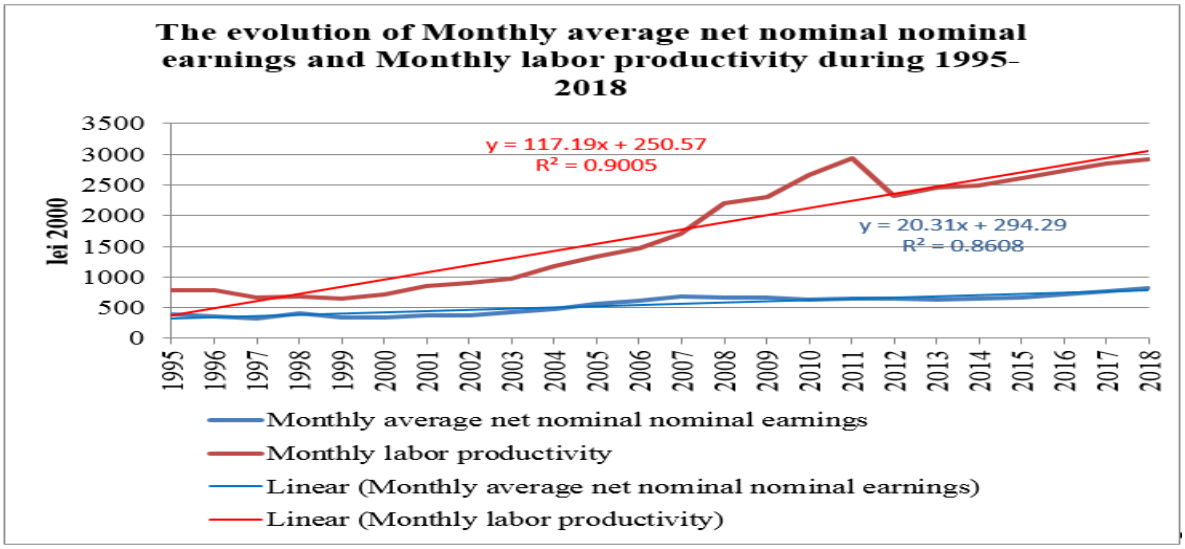

Figure 9.

From figure 9, it can be seen that, at a general level, the evolution of labor productivity regarding Electricity and heat, gas and water has, in general, a trend 5. 77 times higher than that of net wages.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows an inverse evolution, like in figure 10.

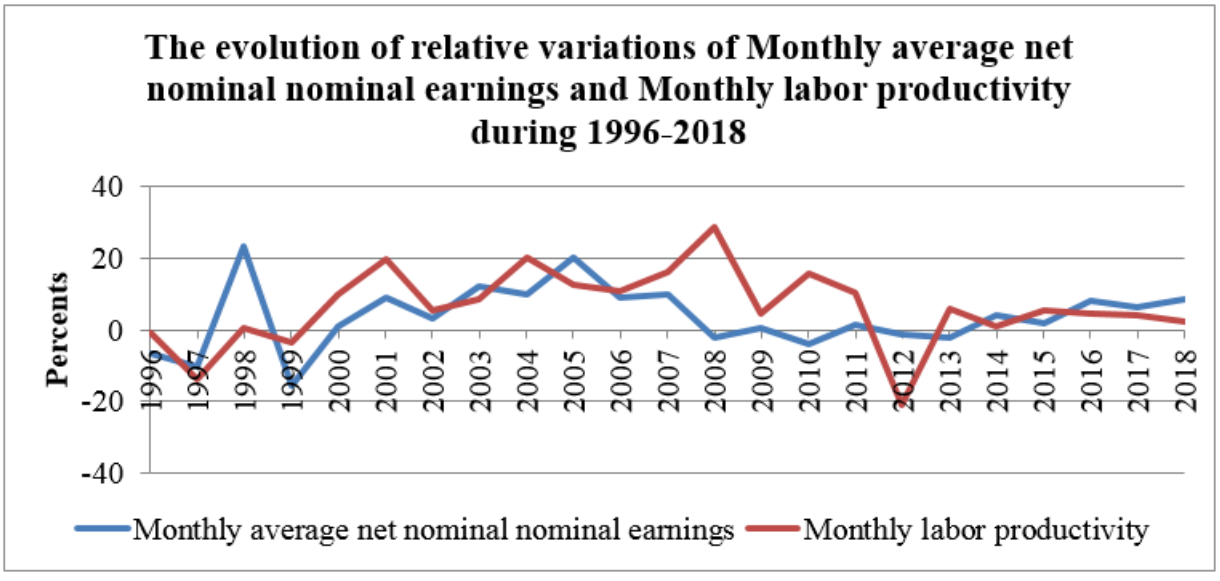

Figure 10.

The analysis of the dependence of the average net wage on labor productivity reveals a higher dependence (with R^2=0. 868), which means that the regression relation:

W=0. 165110694·LP+264. 9192713

shows, in a percentage of 86. 8% the dependence of the average net wage of productivity.

Table 18.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.93146579
R Square	0.867628517
Adjusted R Square	0.861611632
Standard Error	57.58449299
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	478159.909 72951.42432	478159.909 3315.973833	144.1989392	3.92324E-11
Residual	22				
Total	23	551111.3333			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	264.9192713	26.35419066	10.05226359	1.09783E-09	210.2640251	319.5745176
X Variable 1	0.165110694	0. 01374973	12.00828627	3.92324E-11	0.136595499	0.193625889

8. The Analysis of Construction

By the tables 6 and 12 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

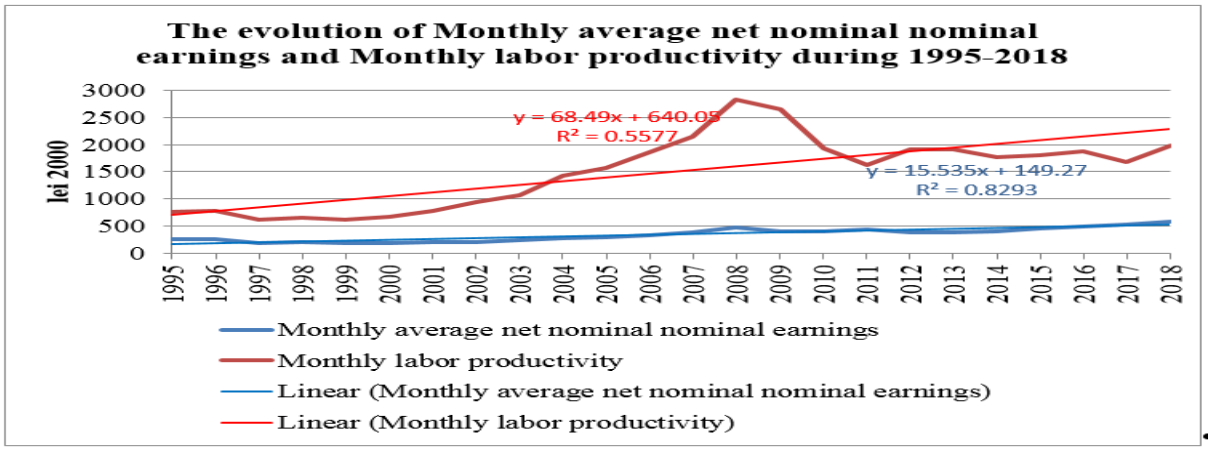

Figure 11.

From figure 11, it can be seen that, at a general level, the evolution of labor productivity regarding Construction has, in general, a trend 4. 41 times higher than that of net wages which leads, over time, to a widening gap between productivity and wage level.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows a direct evolution (except few years), like in figure 12.

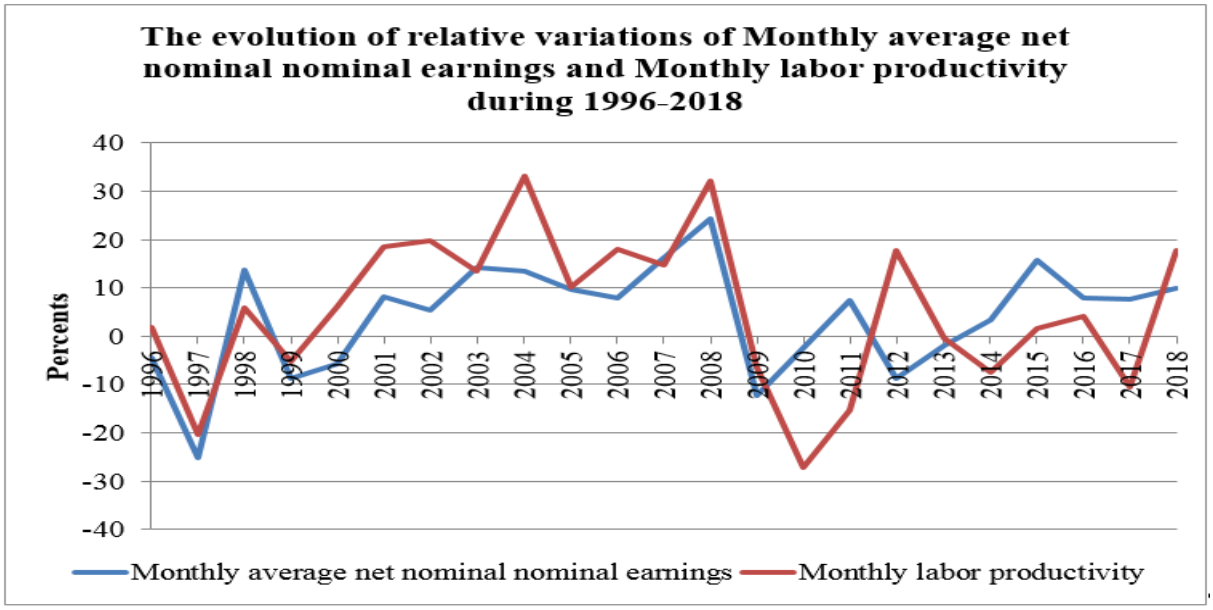

Figure 12.

The analysis of the dependence of the average net wage on labor productivity reveals a moderate dependence (with R^2=0. 645), which means that the regression relation:

W=0. 14934407·LP+120. 0147132

shows, in a percentage of 64. 5% the dependence of the average net wage of productivity.

Table 19.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.802860775
R Square	0.644585424
Adjusted R Square	0.628430216
Standard Error	73.52891426
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	215716.9312	215716.9312	39.89954353	2.34283E-06
Residual	22	118943.0271	5406.501232		
Total	23	334659.9583			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	120.0147132	38.42641989	3.123234316	0.00494863	40.32319595	199.7062306
X Variable 1	0.14934407	0.023643078	6.316608547	2.34283E-06	0.100311327	0.198376814

9. The Analysis of Trade

By the tables 6 and 12 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

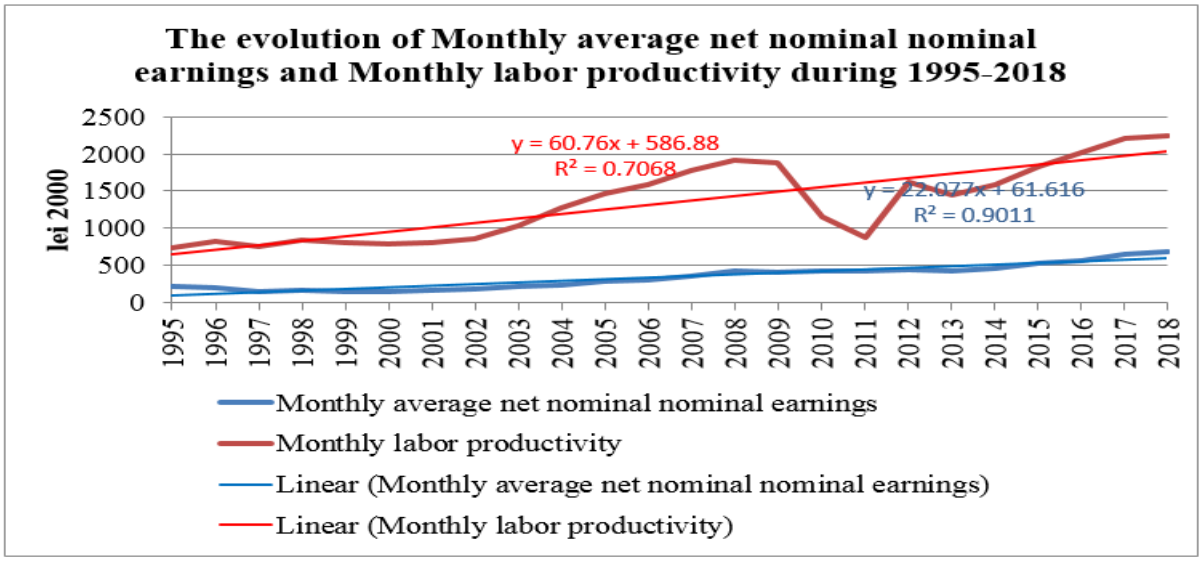

Figure 13.

From figure 13, it can be seen that, at a general level, the evolution of labor productivity regarding Trade has, in general, a trend 2. 75 times higher than that of net wages.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows a direct evolution (except few years – 2010, 2012), like in figure 14. This fact is explained by the fact that Trade has a greater dynamic than the other sectors, the bonus system (especially in the case of small companies) better adapting the wage level to that of labor productivity.

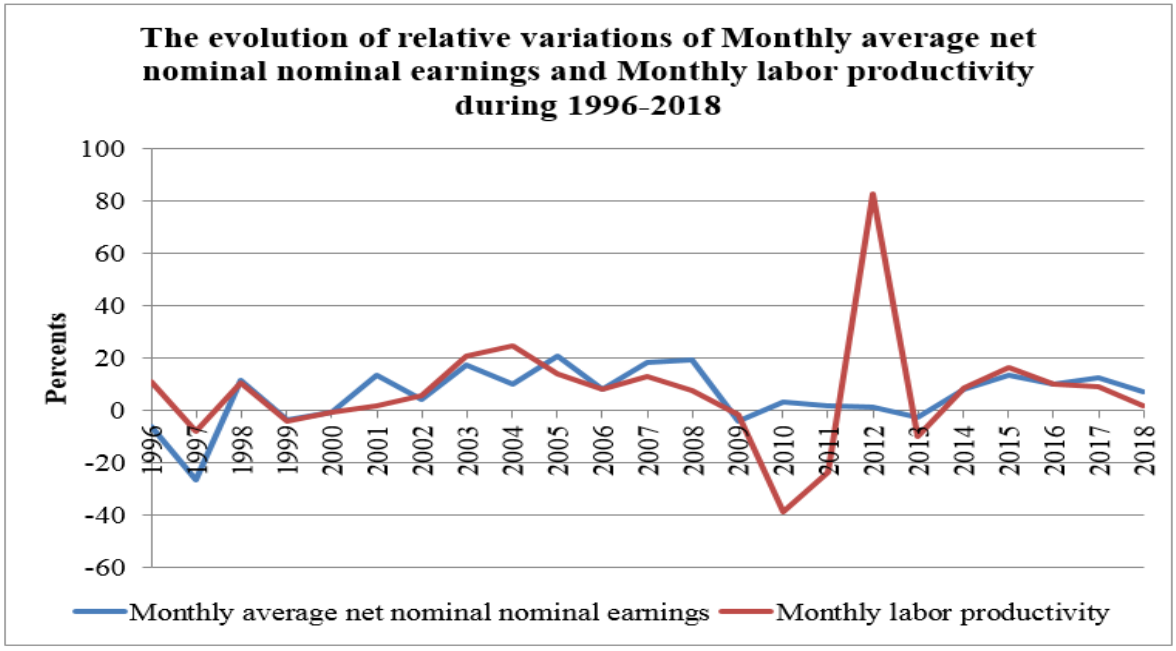

Figure 14.

The analysis of the dependence of the average net wage on labor productivity reveals a moderate dependence (with R^2=0. 761), which means that the regression relation:

W=0. 280751991·LP-40. 4141282

shows, in a percentage of 76. 1% the dependence of the average net wage of productivity.

Table 20.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 872464852
R Square	0. 761194918
Adjusted R Square	0. 750340141
Standard Error	82. 16986216
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	473478. 3359	473478. 3359	70. 12534253	2. 74163E-08
Residual	22	148541. 4975	6751. 886248		
Total	23	622019. 8333			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 58. 0%*	*Upper 58. 0%*
Intercept	-40. 4141282	48. 15446783	-0. 839260198	0. 410350707	-79. 98818334	-0. 84007306
X Variable 1	0. 280751991	0. 033526278	8. 374087564	2. 74163E-08	0. 253199598	0. 308304383

10. The Analysis of Hotels and Restaurants

By the tables 6 and 12 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

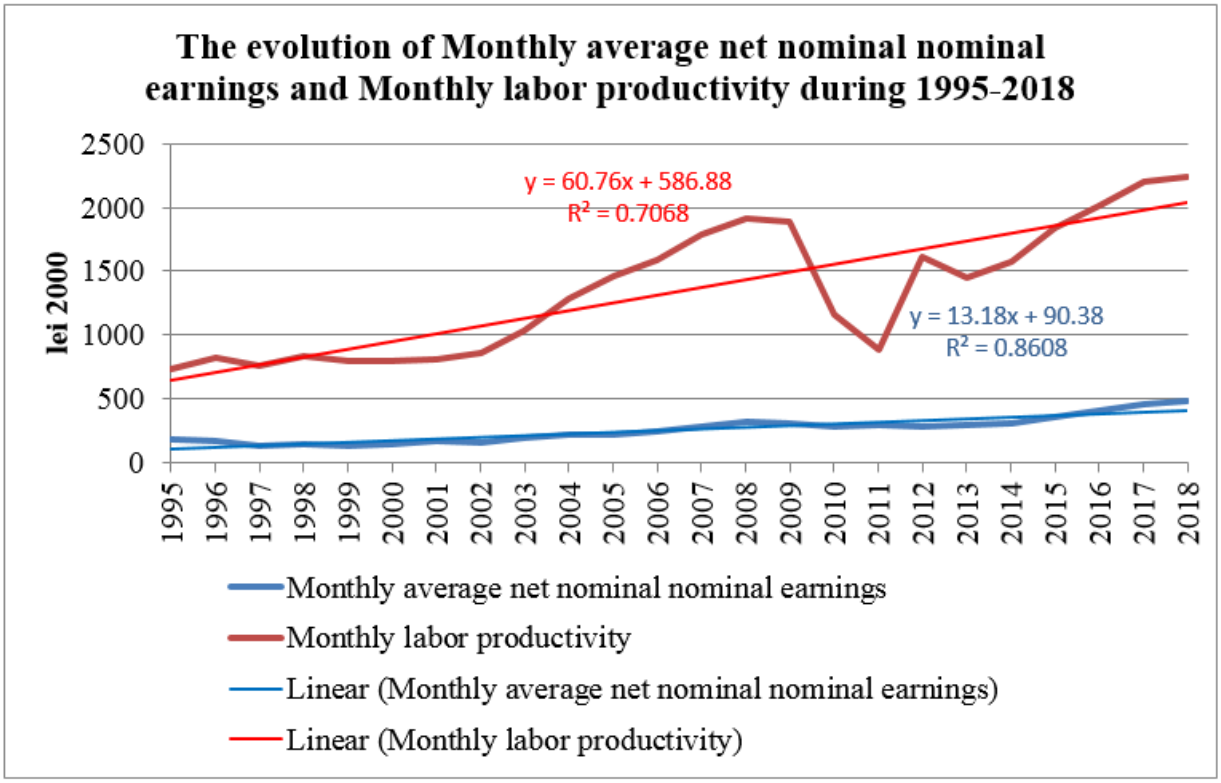

Figure 15.

From figure 15, it can be seen that, at a general level, the evolution of labor productivity regarding Hotels and restaurants has, in general, a trend 4. 61 times higher than that of net wages.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows a direct evolution (except few years – 2011, 2013), like in figure 16.

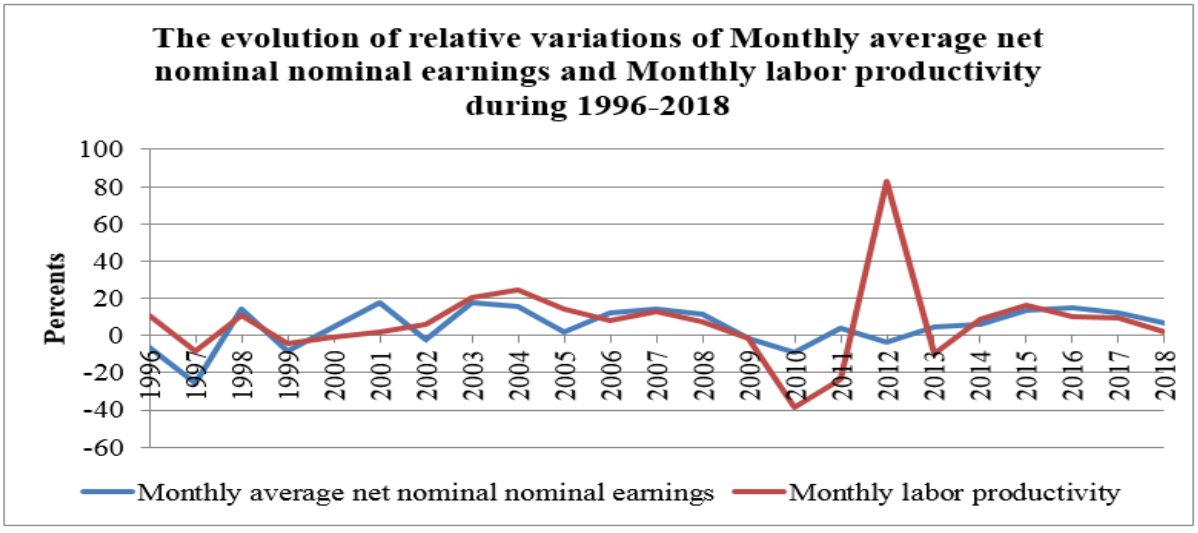

Figure 16.

The analysis of the dependence of the average net wage on labor productivity reveals a moderate dependence (with R^2=0. 815), which means that the regression relation:

W=0. 177470743·LP+16. 18282905

shows, in a percentage of 81. 5% the dependence of the average net wage of productivity.

Table 21.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 902936049
R Square	0. 815293509
Adjusted R Square	0. 80689776
Standard Error	44. 13943037
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	189194. 2601	189194. 2601	97. 10788783	1. 57553E-09
Residual	22	42862. 36489	1948. 289313		
Total	23	232056. 625			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 46. 0%*	*Upper 46. 0%*
Intercept	16. 18282905	25. 86727936	0. 625610016	0. 53800729	0. 079951838	32. 28570627
X Variable 1	0. 177470743	0. 018009411	9. 854333455	1. 57553E-09	0. 166259539	0. 188681946

11. The Analysis of Transport, Storage and Communications

By the tables 6 and 12 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

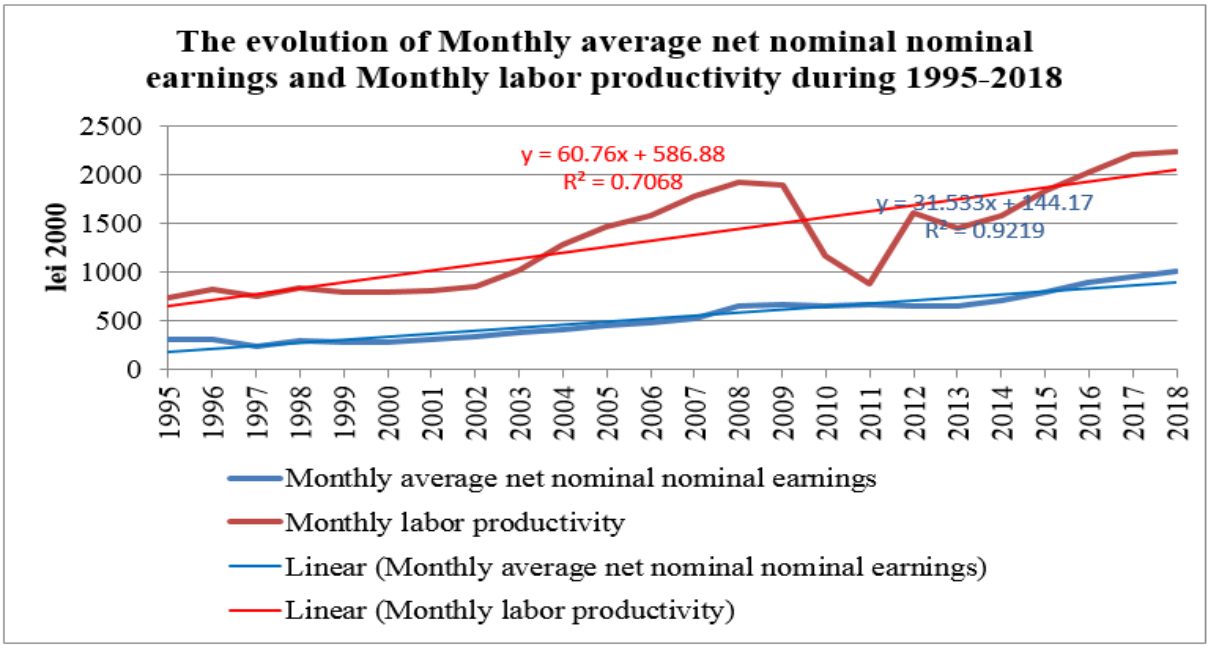

Figure 17.

From figure 17, it can be seen that, at a general level, the evolution of labor productivity regarding Transport, storage and communications has, in general, a trend 1. 93 times higher than that of net wages.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows a direct evolution (except 2012), like in figure 18.

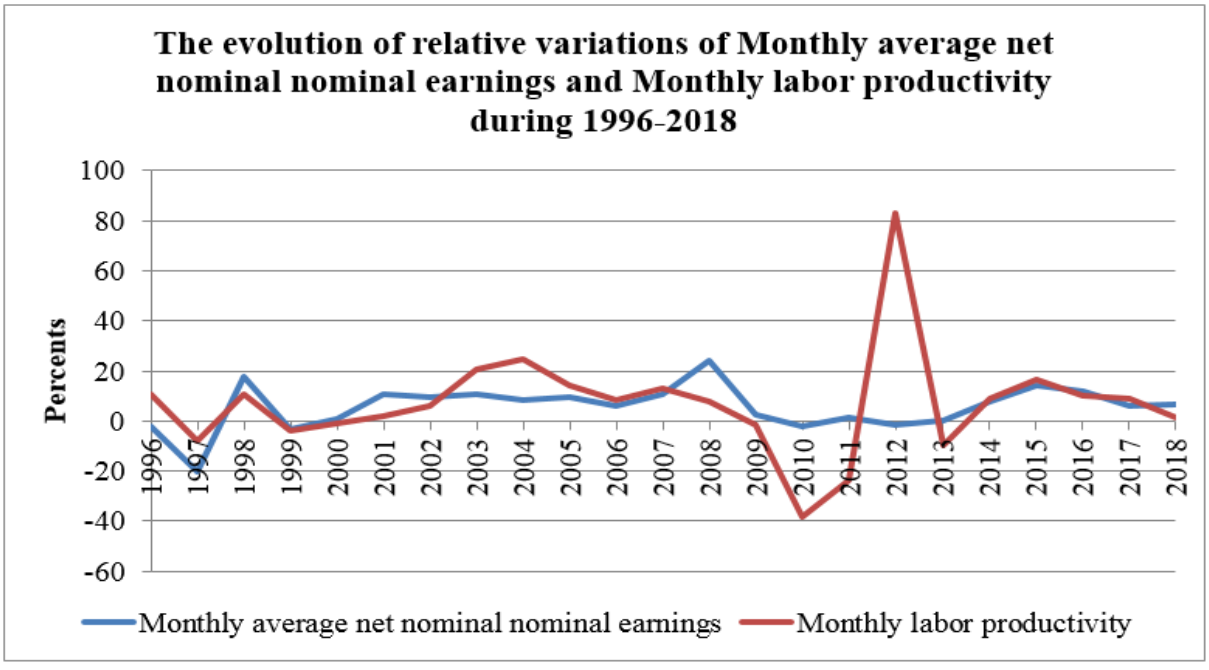

Figure 18.

The analysis of the dependence of the average net wage on labor productivity reveals a moderate dependence (with R^2=0. 763), which means that the regression relation:

W=0. 396908043·LP+3. 946267277

shows, in a percentage of 76. 3% the dependence of the average net wage of productivity.

Table 22.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 87347827
R Square	0. 762964288
Adjusted R Square	0. 752189938
Standard Error	115. 6007246
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	946311. 7277	946311. 7277	70. 81301892	2. 52365E-08
Residual	22	293997. 6056	13363. 52753		
Total	23	1240309. 333			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 4. 0%*	*Upper 4. 0%*
Intercept	3. 946267277	67. 74614472	0. 058250802	0. 954074721	0. 509638094	7. 38289646
X Variable 1	0. 396908043	0. 047166467	8. 415047173	2. 52365E-08	0. 39451538	0. 399300705

On the other hand, the high value of P-value shows that the null hypothesis is accepted with a probability greater than 0. 95.

12. The Analysis of Financial Intermediation

By the tables 6 and 12 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

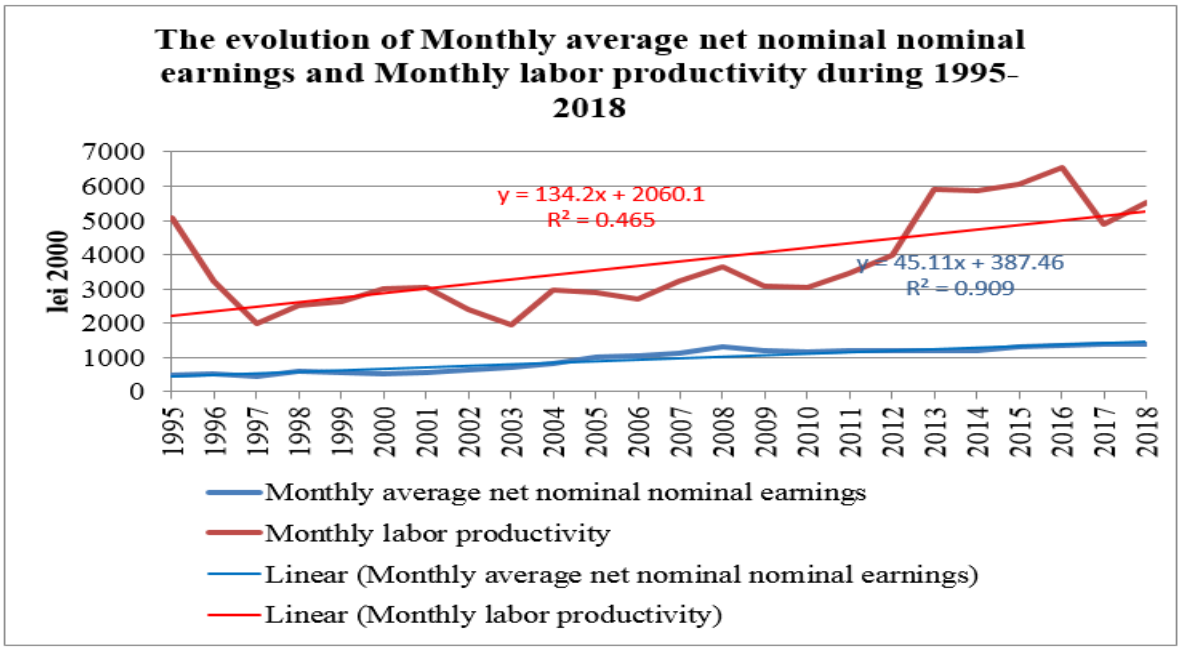

Figure 19.

From figure 19, it can be seen that, at a general level, the evolution of labor productivity regarding. Financial intermediation has, in general, a trend 2. 97 times higher than that of net wages.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows a strange evolution, like in figure 20. If there were periods when the rate of labor productivity was much higher than that of wages (1999-2001, 2010-2014), there have been, paradoxically, periods in which the rate of labor productivity was much lower than that of wages (2001-2003, 2005-2006, 2016-2017).

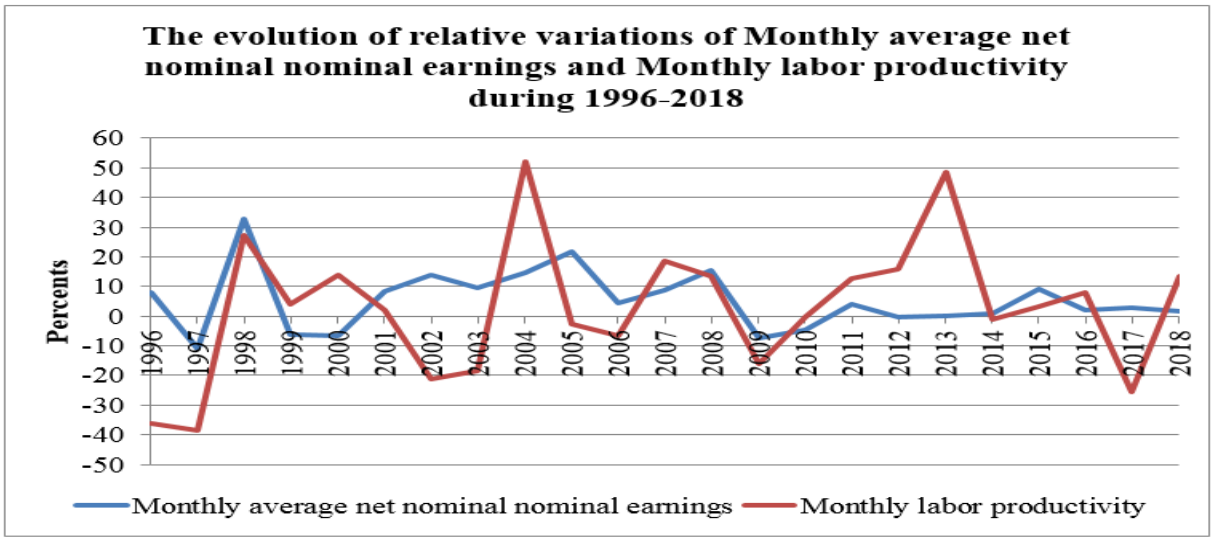

Figure 20.

The analysis of the dependence of the average net wage on labor productivity reveals a lower dependence (with R^2=0. 365), which means that the regression relation:

W=0. 145198943·LP+408. 634135

shows, only in a percentage of 36. 5% the dependence of the average net wage of productivity.

Table 23.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 603946193
R Square	0. 364751004
Adjusted R Square	0. 33587605
Standard Error	272. 6510746
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	939051. 9467	939051. 9467	12. 63208938	0. 001777154
Residual	22	1635449. 387	74338. 60848		
Total	23	2574501. 333			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	408. 634135	162. 5203314	2. 514357014	0. 019737811	71. 58759681	745. 6806732
X Variable 1	0. 145198943	0. 040853179	3. 554165075	0. 001777154	0. 060474635	0. 22992325 1

13. The Analysis of Real Estate Transactions and other Services

By the tables 7 and 13 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

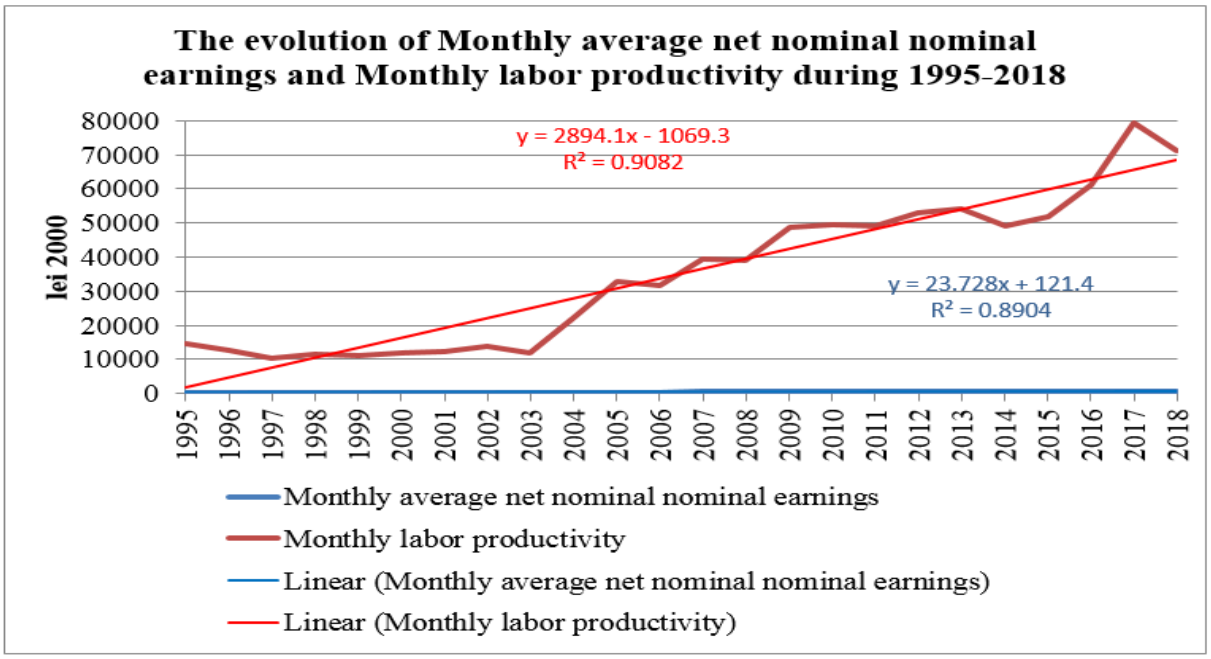

Figure 21.

From figure 21, it can be seen that, at a general level, the evolution of labor productivity regarding Real estate transactions and other services has, in general, a trend 122 times (!) higher than that of net wages.

This may seem paradoxical, but real estate speculation, in particular from 2005-2012, has led to exaggerated high prices, while the level of wages has somewhat followed its natural course.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows a strange evolution, like in figure 22.

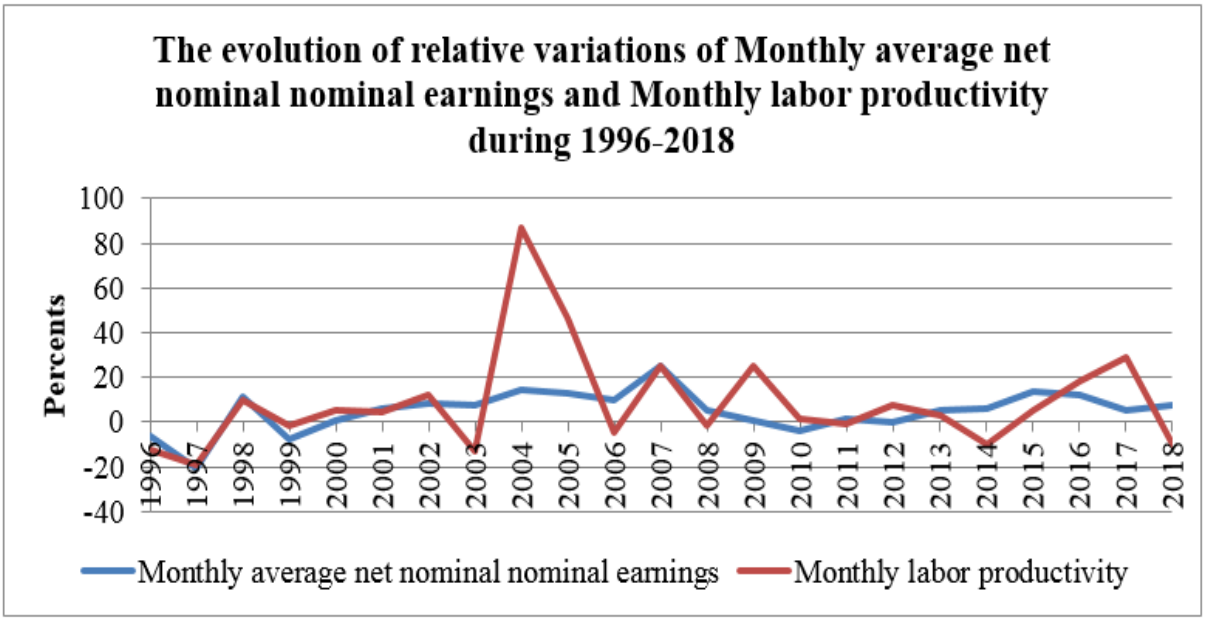

Figure 22.

The analysis of the dependence of the average net wage on labor productivity reveals a higher dependence (with R^2=0. 944), which means that the regression relation:

W=0. 008045779·LP+135. 5378544

shows, only in a percentage of 94. 4% the dependence of the average net wage of productivity.

Table 24.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 971693326
R Square	0. 94418792
Adjusted R Square	0. 941651007
Standard Error	42. 94974481
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	686553.	686553.	372.	2. 82626E-

		0273	0273	1798966	15
Residual	22	40582.97275	1844.680579		
Total	23	727136			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	135.5378544	17.06556364	7.942184462	6. 65722E-08	100.1460415	170.9296672
X Variable 1	0.008045779	0.000417053	19.29196456	2. 82626E-15	0.007180863	0.008910694

14. The Analysis of Public Administration and Defense

By the tables 7 and 13 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

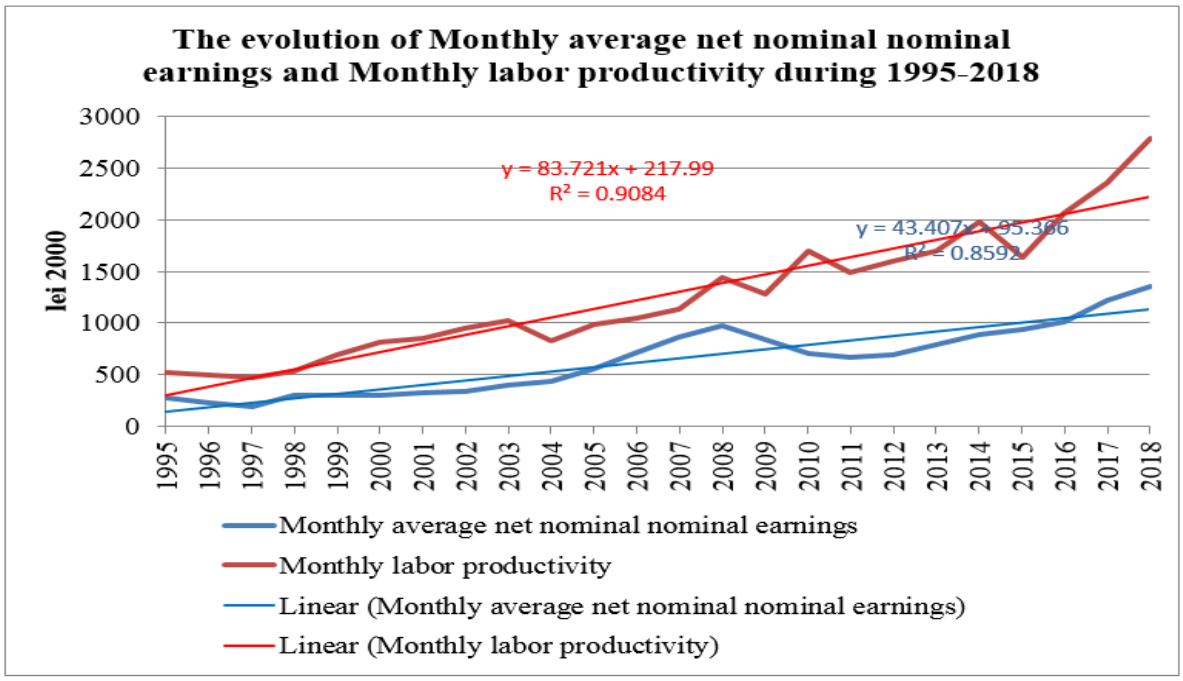

Figure 23.

From figure 23, it can be seen that, at a general level, the evolution of labor productivity regarding Public administration and defense has, in general, a trend 1. 93 times higher than that of net wages.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows a strange evolution, like in figure 24.

There were thus periods in which the wage variation increased unjustifiably much relative to that of labor productivity (1998, 2003-2007, 2013, 2015) and reverse in 1999, 2010.

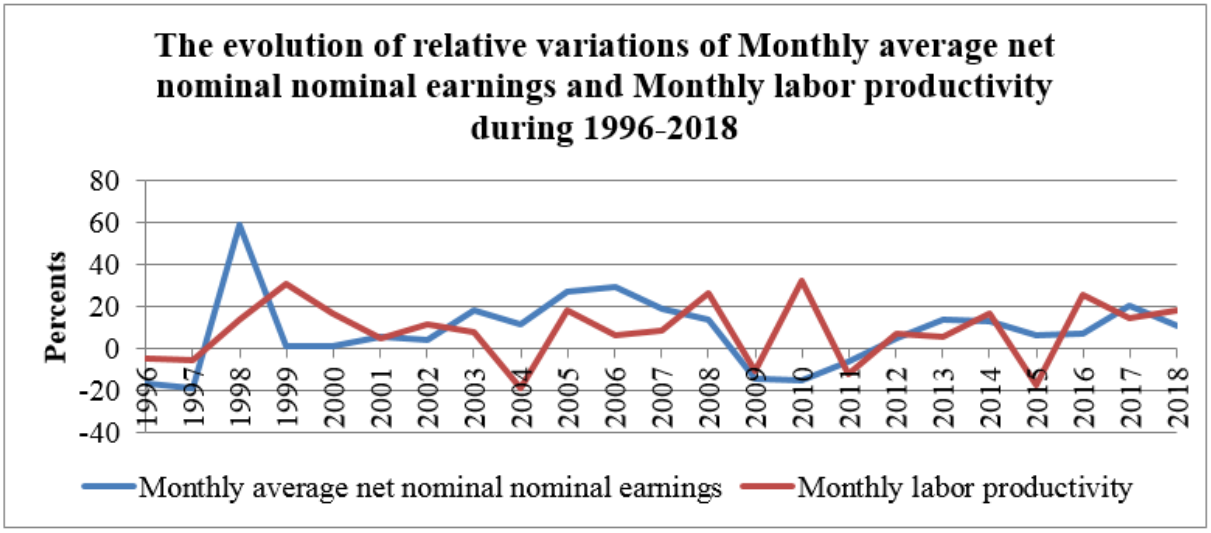

Figure 24.

The analysis of the dependence of the average net wage on labor productivity reveals a higher dependence (with R^2=0. 856), which means that the regression relation:

W=0. 493207206·LP+14. 2978219

shows, only in a percentage of 85. 6 % the dependence of the average net wage of productivity.

Table 25.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 925160843
R Square	0. 855922585
Adjusted R Square	0. 849373612
Standard Error	128. 5134433
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	2158531. 446	2158531. 446	130. 6956882	1. 00261E-10
Residual	22	363345. 5125	16515. 70511		
Total	23	2521876. 958			

	Coefficients	Standard Error	t Stat	P-value	Lower 18. 0%	Upper 18. 0%
Intercept	14. 2978219	60. 53238953	0. 236201181	0. 815461762	0. 358264728	28. 23737908
X Variable 1	0. 493207206	0. 043141852	11. 43222149	1. 00261E-10	0. 483272387	0. 503142024

On the other hand, the high value of P-value shows that the null hypothesis is accepted with a probability greater than 0. 81.

15. The Analysis of Education

By the tables 7 and 13 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

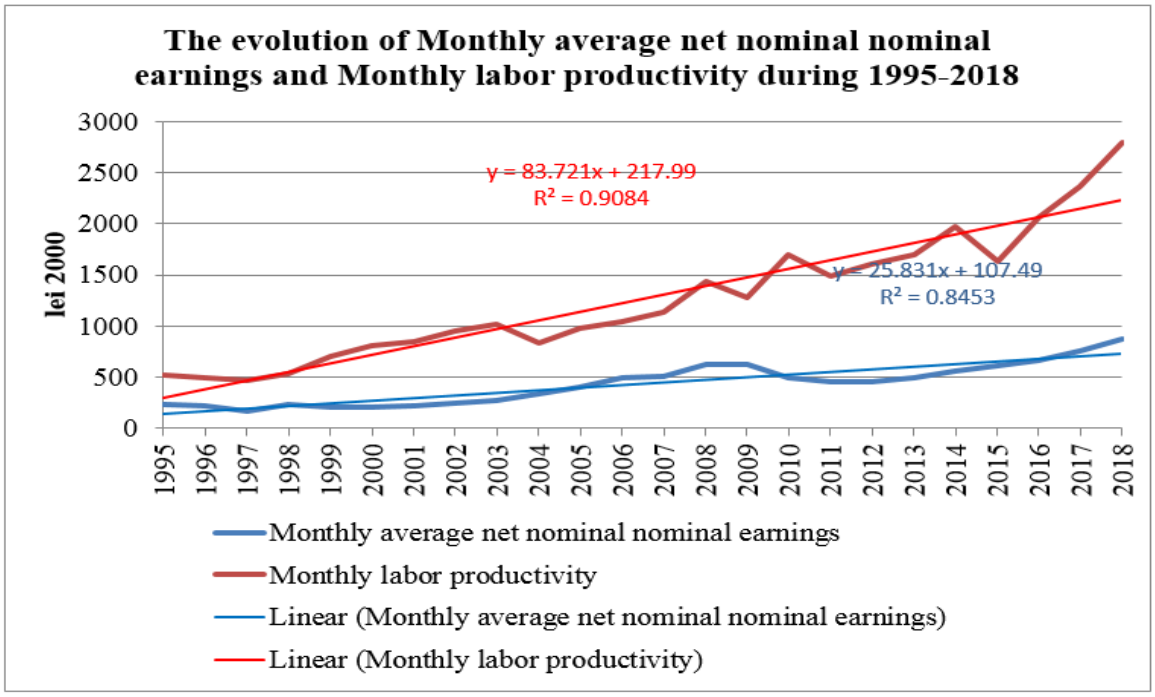

Figure 25.

From figure 25, it can be seen that, at a general level, the evolution of labor productivity regarding Education has, in general, a trend 3. 24 times higher than that of net wages.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows an inverse evolution, like in figure 26.

There were thus periods in which the wage variation increased unjustifiably much relative to that of labor productivity (1998, 2003-2007, 2013, 2015) and reverse in 1997, 1999, 2010.

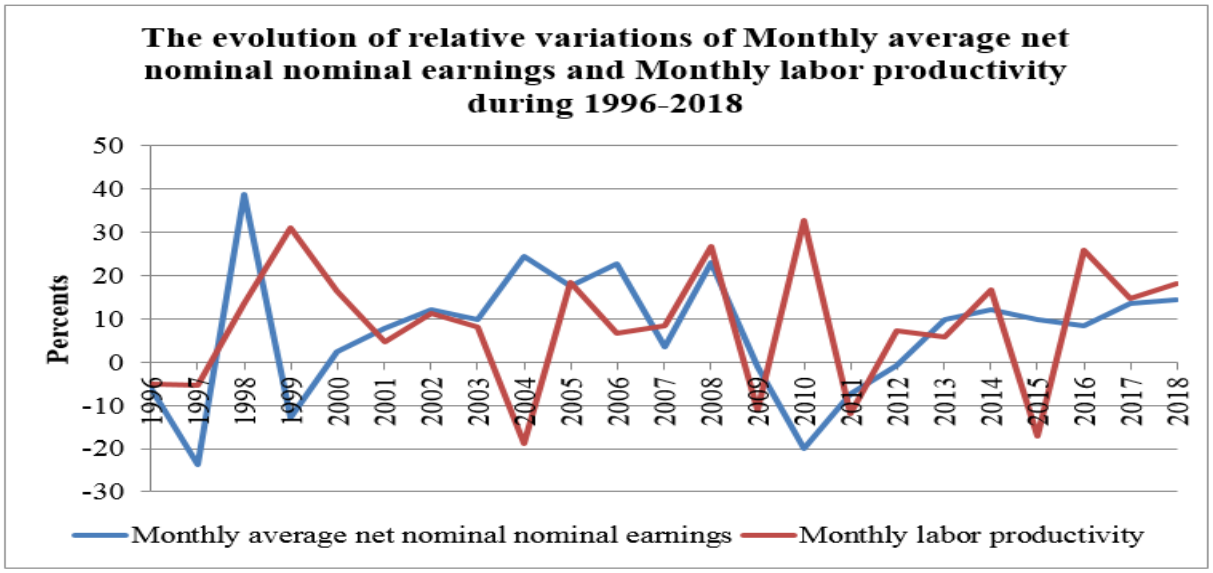

Figure 26.

The analysis of the dependence of the average net wage on labor productivity reveals a higher dependence (with R^2=0. 836), which means that the regression relation:

W=0. 292390152·LP+60. 64765257

shows, only in a percentage of 83. 6% the dependence of the average net wage of productivity.

Table 26.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 914158173
R Square	0. 835685164
Adjusted R Square	0. 828216308
Standard Error	82. 34139495
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	758621. 3079	758621. 3079	111. 8893102	4. 30254E-10
Residual	22	149162. 3171	6780. 105322		
Total	23	907783. 625			

	Coefficients	Standard Error	t Stat	P-value	Lower 86.0%	Upper 86.0%
Intercept	60.64765257	38.78443582	1.563711094	0.132156944	1.265018664	120.0302865
X Variable 1	0.292390152	0.027641935	10.57777435	4.30254E-10	0.250067739	0.334712565

16. The Analysis of Health and Social Assistance

By the tables 7 and 13 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

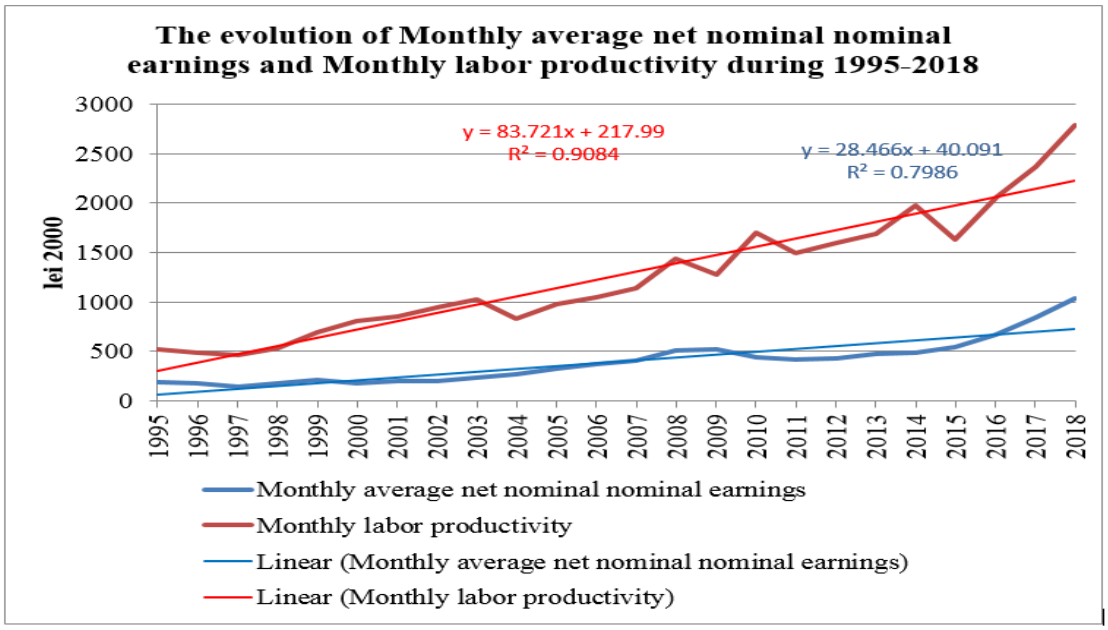

Figure 27.

From figure 27, it can be seen that, at a general level, the evolution of labor productivity regarding Health and social assistance has, in general, a trend 2. 94 times higher than that of net wages.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows an inverse evolution, like in figure 28.

There were thus periods in which the wage variation increased unjustifiably much relative to that of labor productivity (1998, 2003-2007, 2013, 2015) and reverse in 1997, 1999-2000, 2010.

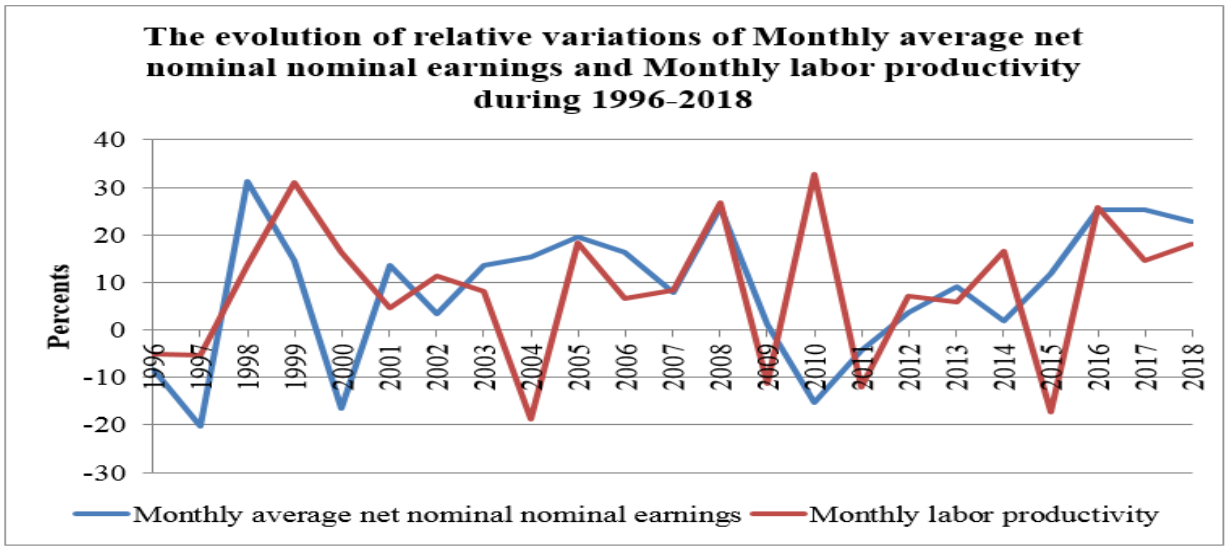

Figure 28.

The analysis of the dependence of the average net wage on labor productivity reveals a higher dependence (with R^2=0. 897), which means that the regression relation:

W=0. 343371468·LP-38. 27655487

shows, only in a percentage of 89. 7% the dependence of the average net wage of productivity.

Table 27.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 946913308
R Square	0. 896644813
Adjusted R Square	0. 89194685
Standard Error	74. 0386617
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	1046231. 918	1046231. 918	190. 8582095	2. 54142E-12
Residual	22	120597. 9154	5481. 723427		
Total	23	1166829. 833			

	Coefficients	Standard Error	t Stat	P-value	Lower 71. 0%	Upper 71. 0%
Intercept	-38. 27655487	34. 87368321	-1. 097577065	0. 284257508	-76. 08783986	-0. 46526989
X Variable 1	0. 343371468	0. 024854715	13. 81514421	2. 54142E-12	0. 316423104	0. 370319832

17. The Analysis of Other Activities of the National Economy

By the tables 7 and 13 we get that the evolution of Monthly average net nominal nominal earnings and Labor productivity during 1995-2018 was:

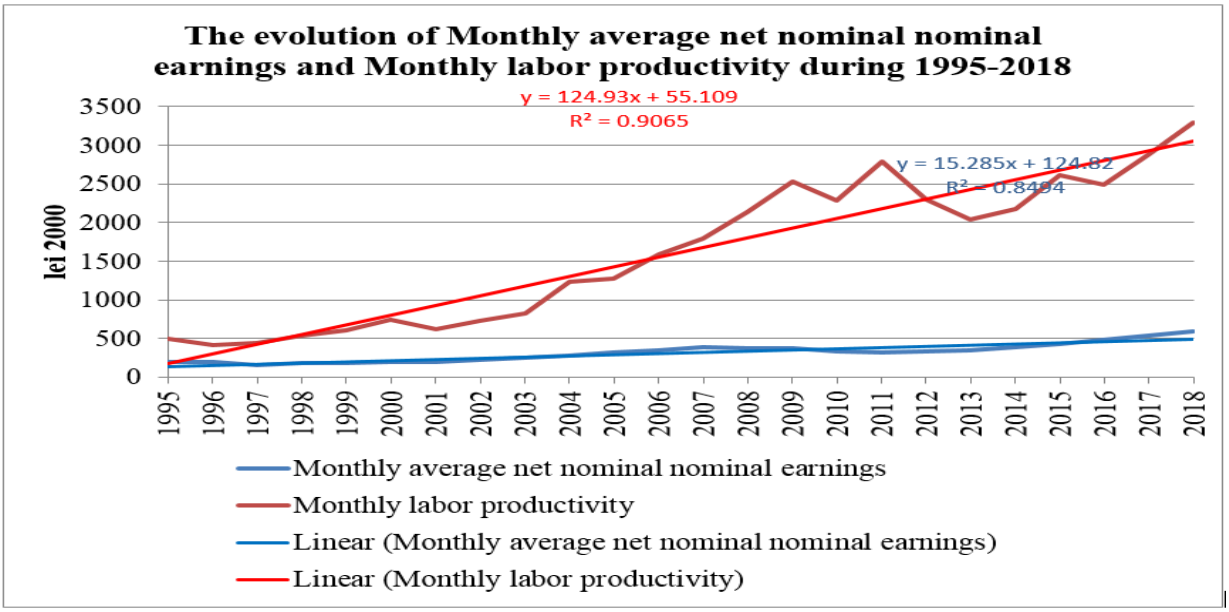

Figure 29.

From figure 25, it can be seen that, at a general level, the evolution of labor productivity regarding other activities of the national economy has, in general, a trend 8. 17 times higher than that of net wages.

On the other hand, the study of the relative evolution of both the average net wage and productivity shows an inverse evolution, like in figure 30.

There were thus periods in which the wage variation increased unjustifiably much relative to that of labor productivity (2012-2014), but, in general, they were mute under the variation of labor productivity.

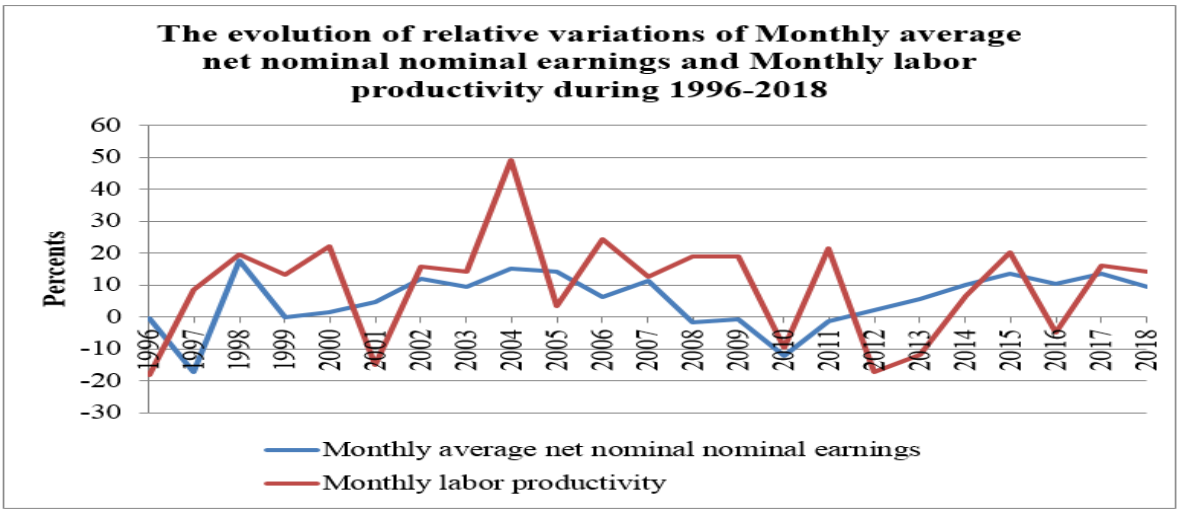

Figure 30.

The analysis of the dependence of the average net wage on labor productivity reveals a higher dependence (with R^2=0. 831), which means that the regression relation:

W=0. 115245092·LP+129. 552497

shows, only in a percentage of 83. 1% the dependence of the average net wage of productivity.

Table 28.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0. 911806017
R Square	0. 831390213
Adjusted R Square	0. 823726132
Standard Error	49. 23616218
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	262974. 2323	262974. 2323	108. 478784 1	5. 72798E-10
Residual	22	53332. 39266	2424. 199667		
Total	23	316306. 625			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*

Intercept	129. 552497	20. 51913065	6. 313742001	2. 35829E-06	86. 99842459	172. 1065695
X Variable 1	0. 115245092	0. 011064965	10. 41531488	5. 72798E-10	0. 09229776	0. 138192425

References

Ioan C. A. (2019). *The chance - between finite and infinite. Probability Theory and Statistics. Revised and added edition.* Galati: Zigotto Publishing House.

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