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KALDOR-VERDOORN'S LAW AND INCREASING RETURNS TO SCALE: A COMPARISON AMONG DEVELOPED COUNTRIES

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Abstract

The object of this study is to investigate the validity of the Kaldor-Verdoorn's Law in explaining the long run determinants of the labor productivity growth for manufacturing industry sector of the main developed economies (Western European Countries, Australia, Canada, Japan, United States). We consider the period 1973-2006 using the data provided by the European Commission - Economics and Financial Affairs. With respect to earlier studies focusing on developed economies, this paper is characterized by a number of original aspects: 1) we test the Kaldor-Verdoorn's Law on data which cover a long time dimension and approach to the most recent years; 2) we investigate empirically whether the Kaldor-Verdoorn's Law is stable after 1986, year that corresponds to the end of the effects of the two oil shocks occurred in the seventies. [JEL Classification: C32 – O47]

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Introduction

The Verdoorn's Law affirms that in the long run productivity generally grows proportionally to the square root of output". In Kaldor's view (1966), the reasons are to be found: 1) into the irrelevance of the initial endowment in the growth process; 2) in the presence of static and dynamic economies of scale and of learning by doing processes; 3) in the relevance of the specialization and interaction process among firms; 4) in the endogeneity of the technical progress, embodied in capital; this argument was analyzed among others by Romer (1986, 1990), Lucas (1988), Grossman Helpman (1991) and Aghion and Howitt (1992, 1998), considered the most prominent endogenous growth theorists.

As reviewed in McCombie *et al.* (2002), empirical literature in the last decades has extensively focused on the estimation of the Kaldor-Verdoorn's Law (hereafter, KVL). Numerous methodologies have been employed using data from different countries, sectors and time periods. Estimated Verdoorn coefficients are in most cases significant and range between 0.3 and 0.6. Under certain conditions, this evidence support the existence of economies of scale.

Bernat (1996) estimated the KVL for US by using spatial econometric techniques and found a statistically significant coefficient in the dynamic law with parameter value of about one third. Fingleton and McCombie (1998), using as Bernat using spatial econometric techniques, focused on the manufacturing sector of the EU-regions. They obtained a significant coefficient of 0.57 and found the presence of significant spatial autocorrelation. Leon-Ledesma (2002) estimated the KVL for the Spanish regions and obtained a Verdoorn coefficient of 0.45. Harris and Lau (1998) studied the UK regions considering each industry of the manufacturing sector by using the cointegration technique. They found that most of the manufacturing industries has increasing returns to scale. Harris and Liu (1999) focused on a large number of countries for the period from 1962 to 1990 and found increasing returns for most of the observed countries. Bianchi (2002) considered the Italian economy both in general and for some specific sectors in the period 1951-97. He found that, while traditional estimates suggest the validity of the KVL both for the whole economy and each individual sector, a partial adjustment model seems to indicate that the KVL is valid only for the case of industry and for the entire sample period. Moreover, Bianchi propose an international comparison with the corresponding experience of the European Union and the United States. These comparisons show the existence of wide differences between these areas. While the estimated Verdoorn coefficient is often statistically significant for the EU countries, it is not for the US. Destefanis (2002) used a non-parametric frontier analysis for a sample of 52 countries for the period 1962-92. The results obtained pointed to a pervasive existence of increasing returns to scale across developed and developing countries. Finally, Ofria (2008) considered a strict definition of manufacturing (not including constructions, mining and the energy production and distribution) for Centre-North and the Southern of Italy during the period 1951-2006. He found that the KVL is valid with parameter value of 0.68 for Centre-North and of 0,77 for Mezzogiorno.

The object of this study is to investigate the validity of the KVL in explaining the long run determinants of the labor productivity growth for the manufacturing industry sector of the main developed economies (Western European Countries, Australia, Japan and United States)[1]. We consider the period 1973-2006 using the data provided by the European Commission - Economics and Financial Affairs (AMECO database). The robustness of estimates is checked by means of the Chow tests (1960). It emerges that the estimated parameters are stable after 1986, years characterized firstly by a significant reduction in oil prices and later by low productivity growth rates.

With respect to earlier studies focusing on developed economies, this paper improves mainly in two aspects: 1) we test the KVL on data of 11 different countries covering a long time dimension and approaching to the most recent years; 2) we suggest an international comparison among some main developed countries; 3) we investigate empirically whether the KVL is stable after the beginning of a period characterized by significant reductions in oil prices and is able to explain the low rates of productivity growth of the last years better than alternative hypotheses such as those related to the existence of supply constraints.

[1]Some developed countries (for instance, Germany and Spain) are not included because some needed data are unavailable.

The structure of the paper is as follows. Firstly, we discuss the main aspects of the KVL. Secondly, we propose a brief review of the prevalent literature available on this subject. Finally, we show the main results from the empirical estimation of the KVL in the period 1973-2006 and suggest a comparison among the countries observed.

1. The Kaldor-Verdoorn's Law

The Verdoorn's Law describes a simple long-run relation between productivity and output growth, whose coefficients were empirically estimated in 1949 by the Dutch economist. The relation takes the following form:

[1] $\dot{p} = a + n \cdot \dot{y}$

where $\dot{p}$ is the labor productivity growth, $\dot{y}$ the output growth (value added), *n* is the Verdoorn coefficient. This functional form reflects the more traditional specification of the Verdoorn's Law, where the variables are expressed in growth rates (dynamic version)[2]. As pointed out by McCombie and Roberts (2007), the static version, to be correctly estimated, would need the use of data belonging to the same "*Functional Economic Area*" (FEA), that is the area where economic spatial processes take place[3]. In the cases this condition is not satisfied the dynamic version give results more correct. In the earlier empirical estimations by Verdoorn (1949), the average elasticity for the manufacturing sector of some countries was about 0.45, with extreme values of 0.41 (United Kingdom) and 0.57 (USA)[4].

Though, initially, Verdoorn (1949) did not attribute to *n* the prevalent meaning of index of the effects due to externalities, this meaning has become primary in the

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[2] As known, the static- dynamic paradox, firstly mentioned by McCombie (1982), relates on the fact that different results are found whether the law is estimated by using variables in levels (static version) or growth rates (dynamic version): in the first case, estimates show the existence of approximately constant returns to scale; in the second case, the empirical evidence suggests the existence of increasing returns to scale.

[3] On this point, the authors affirm (p.187): "This concept of a FEA is intended to capture the idea that whilst, because of agglomeration economies and other externalities, the ideal unit of observation is not the firm, neither is it the type of administrative region that forms the basis for the provision of regional data by the major statistical agencies" […] FEAs are idealized units of observation at a level of aggregation corresponding to that at which spatial economic processes are assumed to operate".

[4] For a detailed review on the values of *n* estimated in literature, see among others: McCombie (2002) and Soro (2002).

interpretation given by Kaldor (1966). In his Inaugural Lecture of 1966, Kaldor adds to the original Verdoorn's Law the contribution due to the capital stock growth, estimated by the gross investment that is considered a proxy of the endogenous technical progress. The investment not only contributes to the economic growth by itself, that is by its effects on the aggregate demand and on the level of output, but also introduces "new" capital goods and hence technological progress in the overall economy.

In Kaldor's view, the exogeneity of $\dot{y}$ in eq. [1] is motivated by the fact that the output growth unlike the neoclassical interpretation is not constrained by the supply-side[5]. Moreover the increasing returns to scale are essentially a "macroeconomic phenomenon" (and in particular of the manufacturing sector) and arise from specialization, learning and accumulation mechanisms as indicated by Young (1928)[6] and in the theory of incorporated technical progress (Maddison, 1979).

Into his *extended lectures* in the University of Cornell, Kaldor (1967) explicitly introduced the investment - output ratio (*I/Q*) as a proxy of the capital growth rate[7], in estimation of eq. [1], to consider the contribution of this variable for the industrial sector of 11 countries (6 CEE countries, UK, Austria, Norway, United States and Canada) along the period 1953 – 1964. The statistical non-significance of the variable *I/Q* *(*results are showed in Mc Combie e Thirlwall, 1994, p. 177) confirms the Kaldor's initial hypothesis that most of the investments are to be considered endogenous in a growth path driven by demand[8]. Similar results on the Verdoorn's Law were obtained in almost all subsequent studies where alternative indicators for capital stock were employed (for review, see: McCombie e Thirwall, 1994; McCombie, 2002; McCombie *et al.* 2002). Moreover, the literature on this subject attempted to enrich the [1] adding some *proxies* among regressors to capture the effects on the productivity growth due to

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[5] The Kaldorian exogeneity of $\dot{y}$ was object of critics by Rowthorn (1975*a*, 1975*b*), determining a relevant debate with Kaldor (1975). For further analyses, see: McCombie e Thirlwall (1994), Gambacorta (2004) e McCombie e Roberts (2007), Ofria (2008).

[6] Young (1928, pp. 538-39) affirms that the phenomenon of increasing returns to scale is a macro phenomenon, since most of the economies of scale are a consequence of the increasing differentiation, of the introduction of new goods, and of new industries, they cannot be adequately perceived observing the effects of changes in the dimension of an individual firm or of a specific industry.

[7] Capital growth can be expressed as the product between I/Q and the output to capital stock ratio (Q/K), which can be assumed as constant in the long run (Kaldor, 1966).

[8] See: McCombie (2002).

the so called "supply factors". The inclusion of regressors like human capital growth, R&S and labor cost indicators did not improve significantly previous estimates (see: Targetti e Foti, 1997; Leòn-Ledesma, 2002, Ofria, 2008). In particular, Ofria (2008) pointed out how labor cost indicators are expected to have a significant and positive impact on the dependent variable for two main reasons: 1) It should encourage processes of substitution between labor and capital, generating more and more innovative processes; 2) It would determine the so-called "incentive effect" as discussed in the New Keynesian Macroeconomics literature, mainly where it focus on the *efficiency wages theory*.

2. Econometric analysis and empirical results

In this section, we search for the determinants of the labor productivity growth in the manufacturing industry. We distinguish the long-term influence of the demand on the productivity growth rate from that deriving from the short-term business cycle which instead reflects the behavior of the so called Okun Law. In order to remove the cyclical component from variables, we estimate a dynamic equation, whose optimal lag structure is chosen by means of the "Schwarz Bayesian Criterion". Such a procedure allows to calculate the long-run elasticity of the productivity growth with respect to output growth (*n*), keeping constant the other variables; 2) To solve the simultaneity problem (i.e. the risk that estimates can be influenced by the feedback of the dependent variable on the independent), we adopt the method of instrumental variables, including two lags of each variable as instruments (plus a constant)[9]. The validity of the adopted instruments is checked by the Sargan test.

Following this strategy, we estimate the following two equations:

[1'] $\dot{p} = a + b_1\, \dot{y} + b_2\, \dot{y}_{-1} + c\, \dot{p}_{-1}$

[2] $\dot{p} = a + b_1\, \dot{y} + b_2\, \dot{y}_{-1} + c\, \dot{p}_{-1} + d\, \frac{I}{Q} + e\, \dot{w}$

[9] Referring to the Verdoorn's Law, this procedure is utilized by McCombie and DeRidder (1984), Ofria (1997, 2008).

where $\dot{p}$ is the labor productivity growth, $\dot{y}$ is the output growth (the value added), $\frac{I}{Q}$ is the investment to output ratio, $\dot{w}$ the average labor cost growth, ($_{-1}$) denotes a one year lag.

The long-run elasticity (or Verdoorn coefficient) either for the [1'] and the [2] is given by the expression

$$n = \frac{b_1 + b_2}{1 - c}$$

The results obtained from the estimates are reported respectively in tables *1*and *2* [10].

Tab. 1

***Estimations eq.* [1']**

Years 1973-2006 obs. n. 34

	Australia	***Belgium***	***Denmark***	***Finland***	***France***	***Japan***	***Italy***	***Norway***	***Sweden***	***UK***	***USA***
Const.	0,0066	0,0078	0,0072	0,0116	0,0093	0,0080	0,0028	0,0039	0,0882	0,0038	0.0115
	(2,31)	(4,39)	(3,64)	(6,40)	(6,50)	(5,27)	(2,17)	(2,04)	(4,08)	(1,49)	(5.05)
$\dot{y}$	0,9206	0,5512	0,6434	0,6995	0,5607	0,6468	0,9171	1,0250	0,8025	0,7850	0,5558
	(3,14)	(3,86)	(4,82)	(10,00)	(8,28)	(9,27)	(15,1)	(3,56)	(6,95)	(3,10)	(5,12)
$\dot{y}_{-1}$	-0,1921	-0,667	-0,5060	-0,6092	-0,499	-0,4703	-0,578	-0,8095	-0,586	-0,5119	-0,291
	(-1,09)	(-4,56)	(-3,83)	(-8,44)	(-6,31)	(-4,85)	(-4,52)	(-4,49)	(-5,11)	(-3,45)	(-2,81)
$\dot{p}_{-1}$	-0,3225	0,5933	0,2949	0,3715	0,3433	0,3408	0,4664	0,3977	0,3789	0,6898	0,0577
	(-1,56)	(3,34)	(2,01)	(3,48)	(3,19)	(2,54)	(3,33)	(2,33)	(2,53)	(4,12)	(5,12)
R^2	0,0850	0,8318	0,6959	0,8610	0,8258	0,8715	0,9070	0,4835	0,8060	0,7394	0,6799
R^2_{bar}	0,1365	0,8150	0,6655	0,8472	0,8084	0,8587	0,8977	0,4318	0,7866	0,6816	0,6468
S.E.	0,0121	0,0056	0,0084	0,0061	0,0032	0,0054	0,0054	0,0088	0,0085	0,0072	0,0079
DW	1,7848	2,0259	1,8483	1,5412	2,0634	2,1944	1,6823	1,6391	1,4876	1,8574	1,9318
S.Cor	0,7767	0,0779	0,5801	2,1721	0,1472	1,0285	1,0448	1,4084	3,7453	0,3148	0,0985
chi.sq= 1	[0,378]	[0,780]	[0,446]	[0,141]	[0,70]	[0,311]	[0,307]	[0,235]	[0,053)	[0,575]	[0,754]
Reset	0,0039	0,0008	0,1214	0,5935	2,5360	0,9361	0,1553	0,7209	0,2671	1,2818	1,3131
chi.sq= 1	[0,950]	[0,977]	[0,728]	[0,441]	[0,11]	[0,333]	[0,694]	[0,396]	[0,605]	[0,258]	[0,252]
Norm	0,4395	1,7799	5,9656	1,6729	0,8721	0,6317	1,5576	0,6904	1,3231	0,0797	0,2111
chi.sq= 2	[0,803]	[0,411]	[0,51]	[0,433]	[0,65]	[0,729]	[0,459]	[0,708]	[0,516]	[0,961]	[0,900]
Heter.	0,1637	0,0780	0,0759	0,0959	0,0041	0,1757	0,1289	0,8237	0,0030	1,3494	0,0629
chi.sq= 1	[0,686]	[0,780]	[0,783]	[0,757]	[0,95]	[0,675]	[0,720]	[0,364]	[0,957]	[0,252]	[0,802]
Sargan	6,3901	13,331	13,3628	3,8788	5,0151	2,2268	3,9881	2,9336	5,1937	9,0033	12,967
	[0,495]	[0,64]	[0,64]	[0,794]	[0,66]	[0,817]	[0,781]	[0,710]	[0,268]	[0,109]	[0,174]
chi.sq	*chi.sq=7*	*chi.sq= 7*	*chi.sq=7*	*chi.sq=7*	*chi.sq=7*	*chi.sq=5*	*chi.sq=7*	*chi.sq=5*	*chi.sq=4*	*chi.sq=5*	*chi.sq=9*
n	0,5508	-0,285	0,1950	0,1435	0,0933	0,2678	0,6342	0,3578	0,3491	0,8804	0,2807
	(2,45)	(-0,38)	(0,74)	(1,07)	(0,65)	(1,76)	(4,31)	(1,01)	(1,80)	(1,09)	(1,85)

Note: *DW indicates the Durbin Watson test; S.E. reports the standard error of the entire regressions; S.Cor reports the Lagrange multiplier for the serial correlation of residuals;* Reset (*Regression Specification Error Test*) is the *Ramsey test; Norm is for Normality test; Heter. indicates the heteroskedasticity test; Sargan is for Sargan test and chi.sq indicates the degree of freedom.*

10 Estimations are employed by the use of the software *Microfit 4.0* by B. Pesaran and M.H. Pesaran.

Tab. 2

***Estimations eq.* [2]**

Years 1973-2006 obs. n. 34

	Australia	***Belgium***	***Denmark***	***Finland***	***France***	***Japan***	***Italy***	***Norway***	***Sweden***	***UK***	***USA***
Const.	0.0642	0,0082	-0,0193	0,0191	0,0162	0,0110	0,020	-0,001	-0,222	-0,018	-0,04
	(2.29)	(0,51)	(-1,30)	(1,13)	(1,11)	(0,50)	(0,8)	(-0,15)	(-0,24)	(-0,78)	(-2,1)
$\dot{y}$	0,7087	1,0023	1,0436	0,7639	0,6166	0,6054	0,814	0,6561	3,8230	0,8028	0,612
	(1,60)	(3,04)	(2,88)	(2,45)	(3,05)	(1,85)	(5,8)	(1,57)	(0,36)	(2,91)	(5,5)
$\dot{y}_{-1}$	-0.1114	-0,254	-0,3642	-0,644	-0,484	-0,432	-0,370	-0,656	-2,463	-0,619	-0,24
	(-0,53)	(-0,85)	(-2,95)	(-3,12)	(-4,64)	(-2,86)	(-1,7)	(-3,01)	(-0,38)	(-3,39)	(-2,2)
$\dot{p}_{-1}$	-0.4423	0,1000	0,2206	0,3484	0,3261	0,3173	0,293	0,4559	0,9676	0,5889	-0,19
	(-2,20)	(0,29)	(1,66)	(2,54)	(2,36)	(2,13)	(1,4)	(3,22)	(0,42)	(3,08	(-1,0)
I/Q	0,1737	-0,601	-0,6329	-0,028	-0,033	-0,009	-0,250	0,0202	1,0262	0,1377	0,293
	(0,26)	(-1,80)	(-1,83)	(-0,53)	(-0,46)	(-0,10)	(-0,8)	(0,83)	(0,25)	(1,06)	(2,8)
$(I/Q)_{-1}$	-0,3938	0,6023	0,7593	-	-		0,176				-
	(-0,56)	(1,86)	(1,97)				(0,8)				
$\dot{w}$	0,0001	0,0775	-0,0378	0,0847	0,0464	-0,058	-0,130	-0,162	1,6633	0,0342	0,058
	(0,000)	(0,34)	(-0,17)	(0,40)	(0,25)	(-0,15)	(-0,9)	(-1,35)	(0,30)	(0,35)	(0,6)
R^2	0,2942	0,7307	0,7892	0,8604	0,8270	0,8694	0,930	0,6937	-4,153	0,7297	0,701
R^2_{bar}	0,1374	0,6709	0,7423	0,8355	0,7961	0,8461	0,915	0,6391	-5,073	0,6443	0,645
S.E.	0,0112	0,0075	0,0073	0,0063	0,0033	0,0056	0,005	0,0070	0,0453	0,0076	0,008
DW	2,0035	1,8462	1,6859	1,7005	1,9872	2,1650	1,934	1,7347	2,1374	0,0342	2,211
S.Cor	0,0086	0,6342	1,7906	1,1282	0,0101	0,5863	0,007	0,8099	0,0988	0,0083	1,186
chi.sq=1	[0,93]	[0,426]	[0,181]	[0,288]	[0,920]	[0,444]	[0,90]	[0,368]	[0,753]	[0,927]	[0,3]
Reset	0,2188	1,6144	4,8762	0,2107	1,3979	1,8288	0,052	0,2192	0,0591	0,2000	0,097
chi.sq=1	[0,640]	[0,204]	[0,27]	[0,646]	[0,237]	[0,176]	[0,82]	[0,640]	[0,808]	[0,655]	[0,8]
Norm	1,5718	16,998	1,0033	3,3671	0,5645	0,4956	1,941	0,3642	0,9334	0,7421	0,219
chi.sq=2	[0,456]	[0,000]	[0,606]	[0,186]	[0,754]	[0,781]	[0,38]	[0,834]	[0,627]	[0,690]	[0,9]
Heter.	0,4388	1,1882	0,1429	0,2922	0,0685	0,5804	0,007	2,4339	3,6175	0,0965	0,774
chi.sq=1	[0,508]	[0,276]	[0,705]	[0,589]	[0,793]	[0,446]	[0,93]	[0,119]	[0,057]	[0,756]	[0,4]
Sargan	2,2375	3,5708	6,4978	1,6436	4,4668	1,8127	3,488	1,4868	0,0295	5,7858	4,794
	[0,692]	[0,467]	[0,165]	[0,896]	[0,484]	[0,612]	[0,48]	[0,685]	[0,985]	[123]	[0,68]
chi.sq	*chi.sq=4*	*chi.sq=5*	*chi.sq=4*	*chi.sq=5*	*chi.sq=5*	*chi.sq=3*	*chi.sq=4*	*chi.sq=3*	*chi.sq=2*	*chi.sq=3*	*chi.sq=7*
n	0,4142	0,8316	0,8716	0,1826	0,1973	0,2533	0,623	-0,001	41,98	0,4460	0,314
	(1,15)	(2,36)	(1,82)	(0,79	(0,67)	(0,70)	(3,24)	(0,00)	(0,01)	(0,65)	(2,66)

Note: *DW indicates the Durbin Watson test; S.E. reports the standard error of the entire regressions; S.Cor reports the Lagrange multiplier for the serial correlation of residuals;* Reset (*Regression Specification Error Test*) is the *Ramsey test; Norm is for Normality test; Heter. indicates the heteroskedasticity test; Sargan is for Sargan test and chi.sq indicates the degree of freedom.*

For Italy, the *n* coefficient is significant at 1% for all estimated equation with value around 0.63. This finding, that under certain conditions implies a high degree of increasing returns to scale for the Italian manufacturing in the period 1973-2006, is near the 0.65 estimated in Bianchi (2002) for the period 1951-1997 and less than the 0.75 obtained in Gambacorta (2004) for the period 1970-2002. This result is also similar to the one found in Ofria (2008) for the Northern and Central areas of Italy in the longer period 1951-2006, while the “Mezzogiorno” showed a higher parameter. Also USA show significant Verdoorn coefficients with values that are around a half of the ones observed for the Italian manufacturing (0.3). This result is in line with previous evidence (for instance, see Bianchi 2002). Australia and Belgium show a significant *n* parameter at least in an equation with the substantial high values of 0.55 and 0.83, respectively. The remaining countries appear not to show a statistically significant Verdoorn parameter.

None of the proxies of the supply variables included in equation [2] appear to be significant. The fact that the investment to output ratio (I/Q) is not significant appear as a confirmation of the Kaldor hypothesis (1966, 1967) and of previous findings, i.e. most of the investments are generally to be considered endogenous in a growth process driven by demand. Also the fact that labor cost growth, $\dot{w}$, is never statistically significant in our estimations is in line with previous empirical findings.

As a check for the robustness of the obtained results, we investigate whether structural breaks occur by the Chow test for predictive failure e structural stability. In particular, we are interested in testing whether the parameters remain stable among the periods 1973-86 (high oil prices) and 1987-2006 (low oil prices). Results, reported in Table 3, suggest that the estimated parameters of eq. [1] and [2] are stable before and after 1986 for all countries considered. This evidence shows that the KVL has a good predictive power and therefore well describes the long term productivity dynamics even in presence of relevant macroeconomic shocks.

Tab. 3
Chow test
Years 1973-1986 and 1987-2006

	Australia	Belgium	Denmark	Finland	France	Japan	Italy	Norway	Sweden	UK	USA
	[1']										
Predictive failure Ch.sq	1,7824 [0,173] *F(22, 10)*	1,114 [0,45] *F(20,9)*	0,1466 [1,00] *F(21, 10)*	1,0469 [0,493] *F(21, 10)*	0,7242 [0,745] *F(21,10)*	0,5303 [0,897] *F(22, 10)*	1,2296 [0,380] *F(21,10)*	1,6491 [0,209] *F(21,10)*	2,8592 [0,10] *F(21,10)*	1,379 [0,35] *F(20 7)*	0,7503 [0,726] *F(22,10)*
Structural stability Ch.sq	1,4255 [0,251] *F(4, 28)*	0,745 [0,59] *F(5,24)*	0,9901 [0,430] *F(4, 27)*	1,9709 [0,128] *F(4, 27)*	1,7191 [0,175] *F(4, 27)*	0,6291 [0,646] *F(4, 28)*	1,0177 [0,416] *F(4, 27)*	0,1571 [0,958] *F(4, 27)*	2,1587 [0,133] *F(4, 27)*	0,875 [0,54] *F(7 20)*	1,049 [0,400] *F(4, 28)*
	[2]										
Predictive failure Ch.sq	0,9878 [0,548] *F(20, 7)*	0,756 [0,71] *F(20,7)*	0,7369 [0,726] *F(21, 7)*	1,5458 [0,188] *F(21, 8)*	2,4348 [0,100] *F(20, 8)*	0,5671 [0,855] *F(20, 8)*	1,0332 [0,521] *F(21, 7)*	1,9046 [0,176] *F(21, 8)*	3,2144 [0,084] *F(21, 8)*	1,414 [0,38] *F(20,5)*	0,4621 [0,920] *F(19, 8)*
Structural stability Ch.sq	0,6313 [0,732] *F(7, 20)*	1,126 [0,39] *F(7,20)*	1,6781 [0,38] *F(7, 21)*	2,1925 [0,810] *F(6, 23)*	2,3205 [0,118] *F(6, 22)*	1,2461 [0,322] *F(6, 22)*	0,7355 [0,645] *F(7, 21)*	1,3391 [0,280] *F(6, 23)*	1,5894 [0,195] *F(6, 23)*	1,643 [0,29] *F(9,16)*	1,0394 [0,428] *F(6,21)*

3. Concluding Remarks

Several studies in literature attempted to detect the long-run determinants of the labor productivity growth for the developed countries. As known, these studies can be grouped in two main schools. The first concentrates on the so-called "supply factors" (above-cited). The second, following the KVL, claims that it exists a stable long-run relation between labor productivity growth and output growth. For the first group, the nineties world crisis in the productivity growth rates can be explained as a consequence of the human capital scarcity, the existence of distortions in the goods and services markets, the excessive labor costs and the low level of investments. For the second group, it is mainly driven by the demand growth crisis.

The objective of this work has been to check whether the KVL for the period 1973-2006 is able to explain the behavior of productivity growth more convincingly respect to possible alternative hypotheses based on the so-called "supply factors". The results support the validity of the KVL for Australia, Belgium, Italy and USA. This can be interpreted as evidence of the presence of increasing returns to scale for the manufacturing sector in these countries. On the contrary, for the other observed countries, the hypothesis of constant returns to scale cannot be rejected. The robustness of our estimates is checked by the use of Chow tests (1960). The estimated parameters are stable after 1986, years in which the world economy was characterized by relatively low oil prices. Finally, the investment to output ratio and the labor costs growth (proxies of the supply factors), when included among the regressors, do not appear significant.

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