

# EARNINGS OF A FENCING MASTER IN BOLOGNA IN XV AND EARLY XVI CENTURY

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## ABSTRACT

The recent findings of some documents which report the sums earned by fencing masters to teach combat disciplines has brought us the possibility to estimate how high this profession was considered, and what was its actual economic value in the Italian late Middle Ages, giving us also a synthetic view on the modes of operation of a sala d'arme in those times.

In this cursory research study we will use some comparative methods on the quoted currencies and on the cost of living at the time to roughly estimate the current equivalent wages of a fencing master operating in the Italian peninsula in the XV and early XVI century.

## SOURCES

The main source for this research is a manuscript document owned by the Archivio di Stato of Bologna<sup>1</sup> and dated 1443 basing on the date of the latest annotation (december 1443). This document contains a series of mails, presumably occurred during a span of several years, between Filippo Dardi, and the government of the city of Bologna. Filippo (or Lippo) di Bartolomeo Dardi was an astrologist and mathematician from Bologna, where he lived and held a sala d'armi starting from 1413 to his death, in 1464 (for more details on Filippo Dardi refer to the relevant entry on

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<sup>1</sup>Archivio di Stato, Bologna, Comune, Governo, envelope N°318, "Riformagioni e provvigioni", Miscellaneous series, envelope N°5. Recently discovered and transcribed by Trevor Dean. The excerpt here reported have been authorized by the author.

Scrimipedia (only Italian)<sup>2</sup> or Wiktenauer<sup>3</sup>). The first part of the document shows how the work of Filippo Dardi was well considered by the city government, to the point he was granted annual wages of 200 *lire* of *bolognini* to practice astrology:

*... te debiano dare omne anno le dicte livre doxento de bolognini, e questo fo perche tu habii caxon de adoperarte piu volentiera in extrologia sopra el stato nostro...*

*...they should give you every year the said two hundred lire of bolognini, and we do this so that you have reason to apply more willingly in astrology for our community...*

The city council stated the maximum price he could ask when teaching martial arts in exchange for these annual wages. In practice the prices requested by the Bolognese Master for his fencing lessons were more than halved in return for a fixed annual payment provided by the city itself. This public investment was justified by the benefits of teaching fencing to the youths of Bologna, thing that was taken into high consideration by the city government.

*...dove tu voi del zuogo dela spada da doe mane livre xxiii de bolognini, io voglio che to non toglii senon livre otto de bolognini, et dove tu toi livre sette del zuogo dela spada del bochilieri voglio che tu noe toglii che iii de bolognini, e dove tu voi L xii del zuogo dela daga tu ne tora L v de bolognini, e dove tu toi L vii del zuogo del baston tu ne tora L iii de bolognini, e dove tu toi L x del zuogo dele braze tu ne tora L iiii de bolognini, e dove toi L otto del zuogo dela rodella o targon tu ne tora L iii de bolognini...*

*...where you ask for the play of two handed sword 23 Lire of bolognini, I want you to take up to 8 Lire of bolognini, and where you want 7 Lire for the play of sword and buckler I want you to take only 3 (Lire) of bolognini, and where you take 12 lire for the play of the dagger you'll remove 5 Lire of bolognini, and where you want 7 L for the stick play you will take 3 L of bolognini, and where you take 10 L for the wrestling you will remove 3 Lire of bolognini, and there you take 8 Lire for the play of rotella or targone you will remove 3 Lire of bolognini...*

This obligation by the city council is probably dated back to the opening of the sala d'arme, and is summarized in the following Table 1.

<b>Discipline</b>	<b>Requested by Dardi</b>	<b>Requested by the Council</b>
Two handed sword	23 lire of bolognini	8 lire of bolognini
Sword and buckler	7 lire of bolognini	3 lire of bolognini
Dagger	12 lire of bolognini	5 lire of bolognini
Stick	7 lire of bolognini	3 lire of bolognini
Wrestling	10 lire of bolognini	4 lire of bolognini
Sword and rotella or targone	8 lire of bolognini	3 lire of bolognini

**Table 1: Dardi - earnings before 1443**

Following this excerpt there is the letter in which Dardi exposes his doubts, after some years, for which these low prices could attract to his teachings more students than his capacity and the

<sup>2</sup>[http://www.scrimipedia.it/mediawiki/index.php?title=Filippo\\_Dardi](http://www.scrimipedia.it/mediawiki/index.php?title=Filippo_Dardi).

<sup>3</sup> [http://wiktenauer.com/wiki/Filippo\\_Dardi](http://wiktenauer.com/wiki/Filippo_Dardi)

physical capacity of the sala d'arme, which he sets at a maximum of 20 students a time. In this situation he also writes about the optimal educational path for a fencer attending his lessons two hours a day, and he also declares he is not bound to follow a student for more than one year:

*...ello imparara la theoricha overo larte dela spada da doe mane in dui mixi e mezo, e la praticha in altri tanti di, e la theoricha del bocholieri in uno mexe e mezo e in altri tanti la praticha, e de zaschuno deli altri zuochi quanto e per theoricha impararano uno da persi da laltro in uno mese, e la praticha in altrettanto...*

*...he will learn the theory of the two handed sword in two and a half months, and the practice in as many days, and the theory of the bucklers in one month and a half and in as much time the practice, and for each other play they learn the theory in one month each, and the practice in as much time...*

We'll summarize the learning times in Table 2.

<b>Discipline</b>	<b>Theoretical Part</b>	<b>Practical Part</b>	<b>Total</b>
Two handed sword	2.5 months	2.5 months	5 months
Sword and buckler	1.5 months	1.5 months	3 months
Dagger	1 month	1 month	2 months
Stick	1 month	1 month	2 months
Wrestling	1 month	1 month	2 months
Sword and rotella or targone	1 month	1 month	2 months

**Table 2: Dardi – learning times for each discipline**

In the end Dardi suggests to the city council to convert the wages he was given to a geometry tenure, possibly with the same compensations, for both astrology and fencing are subjects strictly related to geometry, thing that he is declaring able to demonstrate. In this regards it has to be noted how the title of Reader was related to a tenure in the University; Belonging to this corporation would guarantee, in the medieval Bologna, but not only, a certain standing and some privileges<sup>4</sup>.

Following this request Lodovico Caccialupi and Simone Manfredi, both belonging to a corporation designated by the city council to collect taxes starting from 1440<sup>5</sup>, suggest the council to accept the proposal, but also to review the annual wages from 200 to 150 lire of bolognini:

*...neli soi exercitii e mestieri de strologia e geumetria e dela spada si potesse mantenere e perseverare, el quale serene che ogni anno non obstante la soa domanda de mazore soma fosse tassato solamente livre contocinquanta, zoe liv. 150 de bolognini...*

*...in his practice and works of astrology and geometry and fencing he can continue and move on, and it will be that despite his higher demand, each year he will be payed only one hundred fifty lire, that is 150 L of bolognini...*

In compensation for this decreased wages, Dardi was granted an increase of the teaching prices, as reported in Table 3.

<sup>4</sup>Tiraboschi 1795.

<sup>5</sup>Muzzi 1842:, pag 269, ove si rileva anche che gli anni '40 del XV secolo fossero anni di carenza di denaro per la camera di Bologna.

*...del zuocho dela spada da doe mani livre diece de bolognini, del zuocho dela spada e bucheleri livre quatro, e del zuogo dela daga livre sie, e del zuocho del baston livre quatro, e del zuocho dele braze L cinque, e del zuocho dela rotella o targon L quatro de bolognini...*

*...for the play of two handed sword 10 L of bolognini, for the play of sword and buckler 4 L, and for the play of dagger 6 L, and for the play of stick 4 L, and for the play of wrestling 5 L, and for the play of rotella or targone 4 L of bolognini...*

<b>Discipline</b>	<b>Established by the Council</b>
Two handed sword	10 lire of bolognini
Sword and buckler	4 lire of bolognini
Dagger	6 lire of bolognini
Stick	4 lire of bolognini
Wrestling	5 lire of bolognini
Sword and rotella or targone	4 lire of bolognini

**Table 3: Dardi - earnings after 1443**

From a first approximate calculation we can see a raise of 1 lira for each discipline (except the two handed sword, which raised by 2), which related to 20 students at full capacity, with an average duration of 2.5 months for each course, granted Dardi an average added revenue of 100 lire of bolognini per year, which well compensates the 50 lire annual decrease for the wages, providing the school had full request, which seems evident given the previous proposal by Dardi. This deal favored both the Master and the city treasures.

For a complete transcription of the manuscript document, please refer to Medieval Crime History blog<sup>6</sup>.

The second document to be taken into account is the treatise from the famous Master Achille Marozzo, also from Bologna, for whose bibliographic details we refer to the relevant entry on Scrimipedia (only Italian)<sup>7</sup> or Wiktenauer<sup>8</sup>. Achille Marozzo, who declares himself General Master of the Arts of Weapons, doesn't give hints on his prices in his treatise on the teachings of fencing<sup>9</sup> except a sentence in the third book:

*...perchè sapendo tu che di gioco largo a spada contra spada da due mane io li toglio lire sette di bolognini & de giocho stretto, pure a spada contra spada e contra armi inastate, io toglio altre tante, che sono in tutto lire quatordici de bolognini;...*

*...because you know that for the wide play of sword versus sword, two handed, I take seven lire of bolognini, and for the close play, also sword versus sword, and versus pole weapons, I take as much, which in total are fourteen lire of bolognini;...*

<sup>6</sup><https://medievalcrimehistory.wordpress.com/2015/06/>, Trevor Dean, maggio 2015..

<sup>7</sup>[http://www.scrimipedia.it/mediawiki/index.php?title=Marozzo\\_Achille](http://www.scrimipedia.it/mediawiki/index.php?title=Marozzo_Achille).

<sup>8</sup> [http://wiktenauer.com/wiki/Achille\\_Marozzo](http://wiktenauer.com/wiki/Achille_Marozzo)

<sup>9</sup>Marozzo 1536, libro terzo, pag. 58.

From this excerpt we have a confirmation of the prices for two disciplines.

<b>Discipline</b>	<b>Requested by Marozzo</b>
Two handed sword – wide play	7 lire of bolognini
Two handed sword – close play and against pole weapons	7 lire of bolognini

**Table 4: Marozzo – earnings mentioned in 1536**

Even if limited to just one discipline, we can see how after little more than a century the prices for the teachings of two handed weapon have almost remained the same.

## LIRE AND BOLOGNINI

In the Middle Ages the official currency in Italy was the Lira<sup>10</sup>. The name “Lira” comes from the Latin “libra” (scale / pound). It represents a unit of weight which considerably varies according to zones and time frames, whom equivalent in silver formed the currency unit. Referring to the Treccani encyclopedia the value in weight of one pound was, in average, from 300g to 350g (0.66lb to 0,77lb), even if with considerable variations<sup>11</sup>. In Bologna it is reported to be 361.85g (0.79lb). Factually, the Lira didn't exist as a currency, and it merely represented the base of the monetary system, which was based on sub-multiples. This up to 1472, when the so-said Lira Tron<sup>12</sup> was first forged in Venice, from the name of Venice Doge Nicolò Tron. From then on, the Lira started to be forged also in other cities, among which Bologna in 1529<sup>13</sup>. The Lira was divided in 20 *soldi* (singular *soldo*), and each *soldo* was in its turn divided into 12 *denari*<sup>14</sup> (singular *denaro*).

The Bolognino (plural bolognini), or “soldo bolognese”, was the coin forged and commonly used in Bologna. Starting from 1236, two variations of the bolognino began to circulate in the city: the small alloy bolognino, already forged from 1192, and the big silver bolognino<sup>15</sup>. A small bolognino was the equivalent of one *denaro*, while the big silver bolognino was the equivalent of the *soldo*, maintaining in this way a formal canonical match with the reference Lira<sup>16</sup>: 1 Lira = 20 big silver bolognini, 1 silver bolognino = 12 small bolognini.

<sup>10</sup>[http://www.treccani.it/enciclopedia/lira\\_\(Enciclopedia-Italiana\)](http://www.treccani.it/enciclopedia/lira_(Enciclopedia-Italiana)).

<sup>11</sup>[http://www.treccani.it/enciclopedia/libbra\\_\(Enciclopedia-Italiana\)](http://www.treccani.it/enciclopedia/libbra_(Enciclopedia-Italiana)).

<sup>12</sup>[https://it.wikipedia.org/wiki/Lira\\_Tron](https://it.wikipedia.org/wiki/Lira_Tron), 14/07/2015.

<sup>13</sup> The Lira "of the Famine", name derived by the terrible famine of that year, and by the fact it was forged using funds by the Domenican fathers (Salvioni 1906, pag. 41).

<sup>14</sup> This monetary partition, commonly present in the whole Europe, was derived by the Carolingian currency, the monetary reform which replaced the old Roman currency, that ruled the monetary regulations until the French Revolution ([https://it.wikipedia.org/wiki/Monetazione\\_carolingia](https://it.wikipedia.org/wiki/Monetazione_carolingia)).

<sup>15</sup> Guidicini 1868, pag. 32.

<sup>16</sup> Fanti 2001, pag. 215.

Although the bolognino in the XIII cent. commonly referred to the small alloy one, in the XV cent. The official Bolognino became the silver big one.<sup>17</sup> Later on, after 1380, Bologna also forged the gold bolognino, having same weight and title of the Ducato. The initial exchange rate was established to be 1 gold bolognino = 40 silver bolognini<sup>18</sup>, and after that the gold bolognino was used to commonly identify all the Ducati forged in Bologna.

Worth noticing is that, although the silver content in the bolognino was held constant, its quality was probably worse than the many equivalent of the soldo forged in the many foreign courts, that were commonly found in Bologna. The lower silver content can justify the higher diffusion among the population of Bologna, basing on the Gresham's law<sup>19</sup>. Starting from Bologna, in fact, the bolognino spread in all the Pontifical domains, sometimes even forcedly<sup>20</sup>, becoming the synonym and replacement of the soldo. This fact is confirmed by the references to the many currencies coined in several Italian cities from XIV to XVIII cent. which took their names from the exchange rate with the bolognino<sup>21</sup>. The nominal rate of 20 between bolognino and Lira was constant, and the term bolognino was so widespread in the Papal States to the extent that many currencies with the same name and nominal value were forged in several other cities, like in example the bolognino of Ravenna<sup>22</sup>. Even when Rome started imposing its own currency, the bolognino continued being forged in Bologna, together with the official ones imposed by the Church<sup>23</sup>. Anyway, even when it stopped being forged, the old bolognino with its ratio of 20 to 1 with the Lira continued to be used as the reference value for any other currency and standard in any commercial document of the northern Pontifical delegations, to the extent that in the XVII cent. the Papal States had to publish several bans to avoid the drafting of commercial documents using bolognini<sup>24</sup>.

It is however extremely difficult to have a complete picture of the monetization in Italy or in Bologna in the time, due to the large amount of economical and territorial factors in a so large span

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17 The latest coin of the small bolognino is documented in 1377. After this date there are only references to the "denaro".

18 Guidicini 1873, pag. 203. In Chimienti 2008 the author reports an exchange rate between Ducato and silver bolognino ranging from 34 in 1381 to 74 in 1520.

19 Economic law stated by Thomas Gresham (1519-79), financial agent for Queen Elisabeth 1<sup>st</sup>, for which "When a government overvalues one type of money and undervalues another, the undervalued money will leave the country or disappear from circulation into hoards, while the overvalued money will flood into circulation." It's in fact worthy melting the higher silver content coins in order to obtain more coins of lower quality, but same nominal value.

20 Frati 1877, pag. 319, references to the obligation on using the bolognino as currency in Cesena and Ravenna.

21 <http://numismatica-italiana.lamoneta.it/nominale/Bolognino>, 15/07/2015.

22 Battaglini 1789, pag. 63 e seguenti.

23 <https://sites.google.com/site/moneteedintorni/la-zecca-di-bologna/la-zecca-di-bologna-dal-1506-al-1600>, 15/07/2015.

24 Decree by Pope Alexander VII, which states "...Prohibisce le Lire, e Bolognini nelle Province di Bologna, Ferrara, Romagna e Ravenna, volendo che vi si introduchino li giuli, e bajocchi. Edita A.D. 1660". There we can also find the exchange rate applied to the official currencies, which is 2 giuli = 1 Lira and 1 giulio = 10/11 bolognini, that once again confirms the official rate of 20 to 1 of the bolognino with the Lira.

of time. The present study is limited to a functional approach in order to obtain easily computable and deducible results, without any claim for completeness. For an insight on the interesting story of the Lira as a currency, refer to “The adventures of the Lira”<sup>25</sup>, while for the complete evolution of the monetization in Bologna throughout the centuries, refer to the relevant item in the *Strenna Storica Bolognese*<sup>26</sup>.

## ACQUISITION VALUE

Establishing the current value of a currency is maybe even harder than retracing its history. The currency named bolognino could have different values from place to place<sup>27</sup>. Fortunately, the bolognino of Bologna was taken as a reference in the majority of the Papal States, as we have seen before.

We decided to show three different approaches so to find the most realistic and consistent result, even though each of these approaches involves the implementation of large simplifications and can thus be subject to obvious methodological critiques. Except for some data, here reported for completeness, we tried to apply a temporal frame ranging from 1380 to 1525. Those are years which roughly include our case study and which stand out for a good amount of silver in the bolognino<sup>28</sup> and for a strong stability of the prices<sup>29</sup>.

### ACQUISITION VALUE BASING ON METAL

The most common approach is to convert the quantity of valuable metal contained in the coin to the current value in the modern market. If we want to proceed in this way, we find that it's not really easy to find the exact weight and silver content in thousandths of the bolognini in Bologna between XV and XVI cent. From one side there is the extreme ramification of the coin in various cities of the peninsula, from the other there are several famines and general crisis periods which can influence the quantity of valuable metal added in the coins, which would maintain the same nominal value anyway.

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25 Cipolla 2001.

26 Chimienti 2008.

27 Argelati 1752, pag 323 and following.

28 Other than the aforementioned introduction of the silver Lira in 1529, in 1526 the Mint of Bologna issued for the first time an mixed bolognino, then switching to the *muraiola*, whose value was 2 bolognini, so called given its color, no more white. Even the gold bolognino, issued in 1380, was replaced in 1553 by the golden scudo “of the Sun”, of French origins (Chimienti 2008).

29 The english economists divide the economy from XII to XX cent. In 6 macro-periods: there are two phases of strong stability (1380-1510 and 1630-1760) and two phases of general raise of prices (1270-1380 and 1815-1914). Between 1510 and 1630 there was a fall in the prices, whose lower point was reached in 1597 (Phelps-Brown and Hopkins 1956). The time frame from 1380 to 1510 is almost overlapping with our case study, with the obvious thought in the end of the period. This inflation model doesn't only apply to the Anglo-Saxon world, but it seems to be widespread in the whole Europe with almost the same time scales. Similar statistics performed on Tuscany, Lombardy and in general on the Central-Northern Italy (Malanima 2012) highlight very similar tendencies of the prices. In particular, the first stability period tends to expand from 1381 to 1524.

We know that the silver bolognino, since its very origins, maintained a silver content rather constant throughout the years. The bolognino of 1236 had an official weight of 1.57g (24gr), with 883/1000 of silver content<sup>30</sup>. In order to follow the devaluation the weight of the coin slowly decreased during the centuries. Even though we observe a match of 1.5g (23gr) in the XV cent., this weight drifts down to 1.3g/1.2g (19gr) in early XV cent., oscillating down to 1g (15gr) in the following centuries<sup>31</sup>, even if in the coins in Bologna in our reference period the weight seems to be constant and never drop under 1.2g (18.5gr). In these calculations we have although to take note of the natural deterioration of the existing original samples.

As an example we report in Table 5 the values of the silver bolognini (the big ones) or equivalent ones forged in the Mint of Bologna and classified in the numismatics bulletin<sup>32</sup>:

Coin	Ruler	Years	Maximum weight	
			grams	grains
Bolognino Grosso	Republic (Emperor Enry VI)	1236-1337	1.49	23
Grosso o Bolognino	Giacomo e Giovanni Pepoli	1337-1350	1.34	21
Bolognino	Giovanni Visconti Signore di Milano	1350-1360	1.34	21
Bolognino	Pope Urbano V	1362-1370	1.31	20
Bolognino	Repubblica (Autonomous)	1376-1401	1.24	19
Bolognino	Pope Martino V	1421-1428	1.17	18
Bolognino	Pontifical Anonymous	2nd half XVI cent. 1st half XV cent.	1.15	18
Bolognino	Filippo Maria Visconti Duca di Milano	1428-1443	1.16	18

**Table 5: Summary statistics of rediscovered Bolognini**

As of today silver has a value of 430.15€ per kilogram (472.18\$ /Kg, 14.69\$ /oz). Supposing a silver content of 883/1000 and an average weight of the bolognino, in early XV cent., of 1.2g (19gr), we can estimate an up to date value of the silver bolognino to  $1.2 \times 0.001 \times 0.883 \times 430.15 = 0.43\text{€}$  (0.47\$).

<sup>30</sup> Ditaranto et Al. 2007.

<sup>31</sup> Various Italian numismatic and auctions catalogs, especially for silver bolognini not forged in Bologna.

<sup>32</sup> State Numismatic Bulletin, IUNO MONETA database, research on currency coined by the Mint of Bologna. <http://www.numismaticadellostato.it/web/pns/iuno-moneta/monete/ricerca>.

For the sake of completeness we also report the calculation for the gold bolognino of 1380, even if as mentioned before, in contractual references like our case study, the referred exchange rate was the one with the silver bolognino, coin that as we have seen was more easily payed. If we assume the gold bolognino had a gold content of 995/1000 and weighted 3.45g (53gr)<sup>33</sup>, considering a current exchange of 32192.48€ /Kg (35338\$ /Kg, 1099.13\$ /oz)<sup>34</sup>, we get a current value in gold of the ducato/gold bolognino of  $0.995 \times 32192.48 = 110.51\text{€}$  (121,28\$).

Moving forward with the years and referring to historical data, we can refer to the city council decree on the exact composition of the coin, in 1464<sup>35</sup>. There we can find that the silver bolognini have to be obtained by an alloy of 9 ounces and 5/6 of silver every pound (=12 ounces), resulting in a silver content of 819/1000. We can also find that a pound should weight 396 coins, and an ounce 33 coins (12 ounces = 1 pound). With both these relations we can obtain a weight of 0.91g (14gr) per bolognino. This leads to a current value in silver equivalent to  $0.91 \times 0.001 \times 0.819 \times 430.15 = 0.32\text{€}$  (0.35\$) per bolognino. A pound instead should be equivalent to 103 gold bolognini, which gives us a weight of 3.51g (54gr) per coin, forged at  $18 + 76/103 = 18.74$  carats, equivalent to 781/1000 of gold. We can so obtain a current value of the gold bolognino equivalent to  $3.51 \times 0.001 \times 0.781 \times 32192.48 = 88.25\text{€}$  (96.84\$).

Confronting these actualized values both for silver and gold coins we can obtain a relation to 1 to 250 in both cases, well away from the nominal relation of 1 / 40 of the XV cent. This discrepancy, other than the low value thus obtained, can be linked to the historical facts which separate today life from the medieval one, especially the discovery of the New World, with the subsequent inflow of rare and valuable metals which would cause a devaluation. From 1344 up to 1830 there has always been a almost fixed ratio of 1 to 16 between gold and silver; in late XIX, when silver was no longer used for monetization, this ratio began raising until reaching a record of 1 to 153 in 1939, for then lowering to 1 to 28 in 1971, and raising back to 1 to 110 in 1992<sup>36</sup>.

Even today the values of these precious metals are unstable and not proportional from each other, especially in the past few years, so to be taken as an absolute reference. Just note that after a stable period of almost 20 years, the value of gold oscillates from almost 10000€ /Kg (10974\$) in 2004 to over 42000€ /Kg (46092\$) in 2012, while the value of the silver raised to the equivalent of 124€ /Kg (136\$) of 1996 to over 1000€ /Kg (1097\$) in 2011.

It is also worth noticing that a coin, although of really good real value, always remains associated to a fiducial value, whose intrinsic value is lower than its nominal value, or rather its acquisition value as recognized by the community. As a matter of fact, this line of reasoning can give us an insight on the current “minimum” market value of the currency, equivalent to the mere value of the valuable metal contained in the coin, extrapolating it from the social contest in which it gets used. If we in

<sup>33</sup> The Bolognino forged by the Mint of Bologna for the Republic of Bologna (1376-1401), <http://www.gloriainarte.it/BOLOGNINO.pdf>.

<sup>34</sup> <https://oro.bullionvault.it/Prezzo-Argento.do> 25/07/2015.

<sup>35</sup> Argelati 1752, pag. 311 and following.

<sup>36</sup> <https://en.wikipedia.org/wiki/Silver>, wikipedia entry on Silver. On the Italian version there are also references to its highest value in 1477.

fact analyze the exchange ratio between small (alloy) and big (silver) bolognino in 1236, conventionally stated as 12 to 1, it results higher than the ratio of the silver content, roughly equivalent to 8 to 1, contained in the coins<sup>37</sup>.

#### ACQUISITION VALUE BASING ON PRIME GOODS

A different approach, although not devoid of errors and approximations, consists on confronting the acquisition power for several prime goods of common use. One of the most used goods for these kind of comparisons is bread, which we can find quoted in many accounts and chronicles, even if also its value is greatly influenced by the famine periods and crisis of the place in which it was produced. Fortunately though, precisely for its importance, it is often imposed a price in these periods<sup>38</sup>. Whether these prices were then respected or not is out of the scope of this analysis.

By consulting several chronicles of XV and XVI cent., we can find how with one bolognino (we suppose a silver one) one could buy a much variable quantity of bread, changing in function of the year, of the city, and obviously whether there was famine or not. If we take in example the period of the Italian Wars (1494-1559) it is quite obvious how the value of bread raises up due to the famine generated by the war. In Table 6 we show some prices of the bread in bolognini, when it was possible to retrieve it:

	<b>Year</b>	<b>Place</b>	<b>Distance from Bologna</b>	<b>Price of bread</b>	<b>Note</b>
1 <sup>39</sup>	1310	Forlì	65 km 40 mi	12 denari = 1 bol. 12 or 18 oz of bread	Period of war
2 <sup>40</sup>	1430	Bologna	Countryside included	1 bol. = 36 oz of bread = 3 lb	Period of crisis, but abundance of goods
3 <sup>41</sup>	1464	Cervia	85 km 53 mi	33 bol. = 115 lb of bread from which 1 bol. = 3.48 lb of bread	Expences for the transit of Federico da Montefeltro
4 <sup>42</sup>	1477	Viterbo	240 km	1 bol.	Famine

<sup>37</sup>Milani 2011.

<sup>38</sup> Actually, calculations of this kind should be done trough statistics based on the average prices of a full set of primary goods and services, carefully chosen among material for which there is historic data available during the years. A good example of a well thought set of primary goods could be the sum of wheat, other minor cereals, meat, wine, olive oil, firewood, cloths and accommodation expenses (Malanima 2003), but the current dissertation has a pure illustrative purpose, and we refer to other publications on statistics on the medieval economy reported in the bibliography for further details.

<sup>39</sup>Muratori 1729, pag. 57.

<sup>40</sup>Muzzi 1842, pag. 204.

<sup>41</sup>Cognasso 1965, pag. 248.

<sup>42</sup>Ciampi 1872, pag. 414.

			149 mi	8 or 6 oz of bread	
5 <sup>43</sup>	1500	Forlì	65 km 40 mi	1 bol. 35 lb of bread	Imposed by Cesare Borgia
6 <sup>44</sup>	1505	Imola	30 km 19 mi	1 bol. = 8 to 4 lb of bread or less	Prices to be applied in function of the price of wheat
7 <sup>45</sup>	1505	Bologna		1 bol. = 4 oz of black bread	Famine
8 <sup>46</sup>	1514	Assisi	190 km 118 mi	1 bol. = 4 lb of bread	Decree of podestà
9 <sup>47</sup>	1526	Mantova	85 km 53 mi	1 bol. = 3 oz of bread	Famine
10 <sup>48</sup>	1539	Città di Castello and rest of Italy	135 km 84 mi	1 bol. = 1 lb of bread = 12 oz	Famine

**Table 6: Prices of bread in XV century**

The weight on a ounce in grams is now fixed in 28.35 grams, while in Middle Ages it strongly depended on the place and the year, ranging from 25 grams to 39 grams<sup>49</sup>. The value of the ounce in Bologna, pre-unity, was of 30.15 grams, equivalent to 1/12 of the bolognese pound (361.85g). For easing the calculations, we can assume a standard ratio of 30 grams in the whole peninsula.

Even if really varied, we can isolate the statements done in relatively quite times, or when the prices were imposed (2, 3, 5, 6 and 8). Fortunately these are quite coherent from one another, refer to places moderately near to Bologna, if not to Bologna itself, and are issued on the time frame of reference for our use case: mid XV cent. and early XVI cent. In all five cases we see how a quantity of bread of 3 to 4 pounds was associated to 1 bolognino, approximately 1 to 1.5 kg (2.2 to 3.3 lb). The price seems to keep itself almost stable during the years, until the great changes of XVI cent. (Italian Wars and discovery of America). Basically it seems the devaluation only affected the quality of the coin, as we have already seen, and not its real acquisition value. In period of crisis, obviously, the amount of bread drops down a lot, but we can assume that the documents of our Masters we are analyzing were not taking these aspects into consideration, and were referring to “normal” periods.

43 Pasolini 1893, pag. 352.

44 Alberghetti 1810, pag. 284. In the same document it is stated how the price of wheat reached its maximum in 1505, but the relative price of bread is not indicated.

45 Muzzi 1843, pag. 468.

46 Iacopi 2010.

47 Gionta 1741, pag. 80.

48 Muzi 1844, pag. 111.

49 [http://www.treccani.it/enciclopedia/oncia\\_\(Enciclopedia-Italiana\)/](http://www.treccani.it/enciclopedia/oncia_(Enciclopedia-Italiana)/)

Basing on these reasonings, we can estimate the acquisition value of a bolognino basing on the current value of a primary good as bread today. As of June 2015, the price of bread in Bologna ranges from 1.29€ /kg (0.66\$ /lb) to 5.6€ /kg (2,87\$ /lb), with an average value of 4€ /kg (2,04\$ /lb)<sup>50</sup>. Using this average value we obtain a cost of 0.004€ per gram of bread. We can so estimate the actual acquisition power of a silver bolognino from  $0.004 \times 361.85 \times 3 = 4.34\text{€}$  (4.9\$) to  $0.004 \times 361.85 \times 4 = 5.79\text{€}$  (6.54\$). Making it easier, we can propose 1 bolognino = 4-6 current euros.

As we can see this second approach leads us to an estimated value over ten times higher than the value calculated on the base of the valuable metal content of the coin. This result is certainly more realistic, but probably yet lightly underestimated, basing on the abundance of edible goods in today everyday life.

#### ACQUISITION VALUE BASED ON THE EQUIVALENT WAGES

The latest approach considers the actualization of some of the wages of job figures commonly found in current times. Through the analysis of some chronicles of the city of Bologna we were able to find examples of wages assigned by the city council on which we can base our study. We should also consider, though, together with the different tasks of the workers, also the lack of a national contractual agreement to which we can refer. For these reasons each individual was a case on his own and earned basing on his abilities. In this scenario it's really difficult establishing what could be taken as an average for the category.

	Year	Profession	Wages
1 <sup>51</sup>	1390	Chief bricklayer	10 bolognini for every work day
2 <sup>52</sup>	1392	Architect or Engineer	30 Lire per month
3 <sup>53</sup>	1393	Preacher Bishop	60 Lire per year
4 <sup>54</sup>	1393	Notary	5 Lire per month
5 <sup>55</sup>	1393	Keeper of the Asinelli Tower	5 Lire per month
6 <sup>56</sup>	1429	Treasurer	12 Lire per month
7 <sup>57</sup>	1429	Overseer	12 Lire per month
8 <sup>58</sup>	1431	Member of the Elders' College	5 Lire per month
9 <sup>59</sup>	1431	Chaplain	10 Lire per month

50 Prices and Fares Observatory, Ministry for the Economic Development, Goods and services of wide usage, observed prices – June 2015. It is impossible to have a valuable average for the whole Italy, so we made a research for the city of Bologna: [http://osservaprezzi.sviluppoeconomico.gov.it/index.php?option=com\\_content&view=article&id=22&Itemid=138&arch=0](http://osservaprezzi.sviluppoeconomico.gov.it/index.php?option=com_content&view=article&id=22&Itemid=138&arch=0), 26/06/2015.

51Guidicini 1869, pag.361.

52Guidicini 1869, pag.363.

53Guidicini 1869, pag.364.

54Ghirardacci 1657, pag. 485.

55Ghirardacci 1657, pag. 485.

56Guidicini 1869, pag.367.

57Guidicini 1869, pag.367.

10 <sup>60</sup>	1464	Architect	15 Lire per month
11 <sup>61</sup>	1490	Organist	12 Lire per month

**Table 7: Wages in Bologna in the XV century**

In Table 7 we did not report borderline professions, like the legate, who in 1447 earned more than 500 Lire per month<sup>62</sup>, or the complex figures of readers, auctioneers and law doctors, real prestige figures and reference in the Middle Age Bologna<sup>63</sup>. Among these it's interesting reporting the wages of a Judge in the Merchants' Forum, who in 1490 received a 500 Lire/month salary, and of the relative Appeal Judge, who earned 100 Lire<sup>64</sup>. It was an important position which was assigned once every six months to the doctors in law most worthy of consideration, and it was a source of pride for the whole profession. We should not be too wrong if we compare this position with the highest positions in today State organization.

On the base of these wages and on a pure empiric reasoning, we are confident in speculating the actual value of a Lira from 150€ to 200€ (170\$ to 225\$), which equals to suppose the current value of one bolognino to be 7.5€ to 10€ (8.4\$ to 11.3\$). This value is slightly higher than the one supposed using the price of bread, but certainly comparable. It should also be highlighted how the reported salaries are not referred to popular jobs<sup>65</sup>, even if we don't think this invalidates our analysis.

## CONCLUSIONS

Discarding the first approach and leaving our analysis on the other two, we can suppose as an average indicator of an hypothetic exchange rate bolognino/EUR the value of 7.5, with a possible variability range of 30%. We should always take note that the simplifying approximations we introduced make the following estimations a rough indicative value, which should be taken into consideration only to give an order of magnitude for comparison, and nothing more.

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58Muzzi 1842, pag. 214.

59Muzzi 1842, pag. 214.

60Guidicini 1869, pag.371.

61Guidicini 1869, pag.371.

62Muzzi 1842, pag. 379.

63 Wages of these figures largely vary and are really linked to the person and his actual political histori in the city. We can find salaries of 300 Lire per year in 1384 (Muzzi 1843, pag.327), 550 Lire per year in 1439 (Muzzi 1843, pag..324), 400 Lire per year in 1444 (Muzzi 1843, pag.299), and go up to 1200 Lire per year in 1460 (Muzzi 1843, pag.367) and 1000 Lire per year in 1498 (Muzzi 1843, pag.315).

64Muzzi 1843, pag.161.

65 On the wages of the less wealthy classes, we can report the current daily wages that were found in the building sector, in Tuscany, in late XVI cent.: women 4-5 soldi; manual workers 8-12 soldi; chiefs 15-20 soldi (Pinto 2008); while in 1474 and 1475 the workers hired for the excavation of an irrigation ditch near Pavia were payed 3 soldi per day (Zanoboni 2014).

Basing on the previous analysis, we can make some assumptions and correlations to today life of what we read on the documents. Supposing an exchange bolognino/EUR of 7.5 ( $\pm 2.5$ ), we find that up to 1443, Filippo Darti earned by the city of Bologna wages of 200 Lire = 4000 bolognini = 30000€ per year ( $\pm 30\%$ ), in order to work, we suppose for free, the job of astrologist/astronomer for the city. Wages that in 1443, in years of monetary crisis of the city, were lowered to 150 Lire = 3000 bolognini = 22500€ ( $\pm 30\%$ ), granting the role of reader in Geometry in exchange.

In the same way we can transpose in Table 8 his earnings as a fencing Master, as shown in Table 1 and Table 3. From now on we consider all the actualized prices with the 30% aforementioned margin:

Discipline	Requested by Dardi	Established by the Council before 1443	Established by the Council after 1443
Two handed sword	3450 euro	1200 euro	1500 euro
Sword and buckler	1050 euro	450 euro	600 euro
Dagger	1800 euro	750 euro	900 euro
Stick	1050 euro	450 euro	600 euro
Wrestling	1500 euro	600 euro	750 euro
Sword and rotella or targone	1200 euro	450 euro	600 euro

**Table 8: Dardi - actualized earnings**

We can actualize the earnings of Master Marozzo in the same way from Table 4:

Discipline	Requested by Marozzo
Two handed sword – wide play	1050 euro
Two handed sword – close play and against pole weapons	1050 euro

**Tabella 9: Marozzo - actualized earnings**

Other than that, we can estimate a monthly or even hourly cost basing on the durations of the courses, as noted by Dardi in Table 2. We suppose that the 2 hours per day dedicated to every student were held for 6 days a week, excluding Sundays. Each month composed by an average of 26 days of study, equals to 52 hours. The result of the calculation is noted in Table 10.

Discipline	Duration	Monthly/hourly cost before 1443	Monthly/hourly cost after 1443
Two handed sword	5 months = 260 hours	240 euro / 4.61 euro	300 euro / 5.76 euro
Sword and buckler	3 months = 156 hours	150 euro / 2.88 euro	200 euro / 3.84 euro
Dagger	2 months = 104 hours	375 euro / 7.21 euro	450 euro / 8.65 euro
Stick	2 months = 104 hours	225 euro / 4.32 euro	300 euro / 5.76 euro
Wrestling	2 months = 104 hours	300 euro / 5.76 euro	375 euro / 7.21 euro
Sword and rotella or targone	2 months = 104 hours	225 euro / 4.32 euro	300 euro / 5.76 euro

**Table 10: Dardi – actualized prices per discipline**

The first thing to note is how the most economic discipline to learn was sword and buckler, probably the most commonly diffused discipline in Bologna at the time<sup>66</sup>. The most expensive one is instead the dagger, which is quite obvious if you consider it was at the base of self defense in a turbulent city like Bologna in XV century.

<sup>66</sup> Marozzo 1536 and Manciolino 1531. The base discipline of the teachings of both Bolognese Masters is sword and buckler.

These prices are more or less consistent with the prices of a modern martial arts gym. In an hypothesis of a two-days workout session per week, of 2 hours, approximately 17 hours per month, and basing on a monthly fee of 100€ (113\$), we have a hourly cost of about 6€ (6.8\$)<sup>67</sup>, cost which can be normally lowered with multi-month or annual subscriptions. To this comparison it should be underlined how today offers for sports courses is much more diversified and widespread, while in XV cent. fencing was an exclusive teaching, and Dardi can be considered as a sort of luminary in the matter, to the extent he had to be limited by the city council so to diffuse his teachings as much as possible. To be noted how in the start Dardi was requesting more than three times the wages the city council established.

Presuming the teaching was equally distributed in all the disciplines during the lessons, we have an average of 4.86€ per hour (5.5\$) before 1443, and 6.17€ per hour (7\$) after 1443. Supposing a working schedule of 6 days per week (approximately 310 days per year, removing Sundays and some holidays), limiting the teaching of fencing to 4 hours per day, so to leave the remaining hours for the job of astrologist, we can push the estimations of an hypothetical total annual earning of Filippo Dardi to around 120000€ (c. 138000\$) per year before 1443, and 150000€ (c. 170000\$) per year after 1443, for the teaching of fencing only. We also have to add wages for 30000€/22500€ (c. 35000/26000\$) per year for the job as an astrologist/astronomer. To be noted that these estimates refer to years with a full schedule of 20 students on the classes, with courses of 2 hours 2 times per day. It is highly probable that this estimate is quite optimistic and doesn't reflect the real rhythms of the sala d'arme. It's way more probable that the teachings were limited to only the 2 hours per day stated in the document. In this case the earnings would have to be halved to almost 60000€ (c. 70000\$) per year before 1443 and almost 75000€ (c. 85000\$) per year after 1443, always on the hypothesis of a full schedule. In any case these estimates put Dardi's earnings to the level of a modern highly specialized professional, if not more<sup>68</sup>.

Moving the focus on Achille Marozzo, we don't have indications on the duration of his course of two handed sword, but on the base of the informations by Dardi, we can presume about 3 months for theory and practice for the wide play of two handed sword, and the same for the close play. One month more than the teachings of two handed by Dardi comes from the defense against pole weapons, which were slowly becoming the rulers of the battlefields, included by Marozzo in his teachings. Results are in Table 11.

<b>Discipline</b>	<b>Duration</b>	<b>Monthly/hourly cost</b>
Two handed sword – wide play	3 months = 156 hours	350 euro / 6.73 euro
Two handed sword – close play and against pole weapons	3 months = 156 hours	350 euro / 6.73 euro

**Table 11: Marozzo – actualized prices per discipline**

<sup>67</sup> Estimate done on professional gym running profit-making courses. In current historical fencing courses held by non-profit associations, the courses, reserved to the members, usually request a way lower monthly contribution. As an example, being a member and attending the courses of Sala d'Arme Achille Marozzo, which in 2015 is the biggest HEMA association in Italy, requires an hourly average contribution of 2/3€ at maximum.

<sup>68</sup> Federica Micardi, on Sole 24 Ore of December 11<sup>th</sup>, 2014, states the average annual earnings of the wealthier professions of 2014, basing on the relative welfare treasury: Notaries 101130 euro, Medics 75308 euro, Journalists 61180 euro, Accountants 60288 euro, Bookkeepers 57033, Lawyers 43815 euro.

These prices are aligned with the ones imposed to Dardi by the City Council. Although it seems the wages of Marozzo are higher than the ones of Dardi, the period of activity of Marozzo is way nearer to the time frame of relative price stability we stated before. The year 1536, publishing year of his treatise, is already fully inside the Italian Wars, and several famines have already hit Italy starting from the first two decades of XVI century. It is possible that for this reason his wages, although being formally higher than Dardi's, is reflected by a way lower acquisition power. It is also totally possible that the prices stated by Marozzo were written way before the publishing date of the treatise. We don't have (yet) other information on the courses held by Marozzo, so we cannot make other assumptions, being said that the principles of the analysis done on the earnings of Dardi can be applied also to Master Marozzo, almost a century after.

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